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The Computation and Graphical Display of the NSF Water Quality Index from the STORET Data Base Using the Integrated Plotting Package. Program Documentation & Users Guide

Environmental Protection Agency, New York. Data Systems Branch

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The NSF-Water Quality Index is a numerical expression which reflects the composite influence of nine physical, chemical and bacteriological parameters to water quality. It was developed and has been widely field tested by the National Sanitation Foundation as a means for reporting the current status and trends of water quality.

This Report documents the logic and operation of three computer programs developed to present this index in report and/or graphical form using the STORET Database as input and the graphics capability of the Integrated Plotting Package. Data from the Raritan Basin is presented as a test application.

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The Computation and Graphical Display of the NSF Water Quality Index from the STORET Data Base Using the Integrated Plotting Package

PROGRAM DOCUMENTATION & USERS GUIDE

George A. Nossa, Chief
Systems Management Section
Data Systems Branch
Management Division
U.S. Environmental Protection Agency
New York, New York

October 1976

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ABSTRACT

The NSF - Water Quality Index is a numerical expression which reflects the composite influence of nine physical, chemical and bacteriological parameters to water quality (1). It was developed and has been widely field tested by the National Sanitation Foundation as a means for reporting the current status and trends of water quality.

To address this need of analyzing and reporting trends in water quality a set of three computer programs have been developed to present this data in both report and graphical forms. The source of the data is a file created from the STORET data base by a standard retrieval. The graphical output is generated by the Integrated Plotting Package (2,3).

This report documents the logic and operation of the programs and presents the data from the Raritan River Basin as a test application.

INTRODUCTION

One of the most effective and meaningful ways in communicating information on water quality to top management and the general public is with a water quality index.

The "PDI" index which was developed by the MITRE Corporation[4] (Prevalence - Duration - Intensity Index), allows for a water body to be described in terms of the prevalence, duration and intensity of its water pollution. This index was based on how much water quality deviates from water quality standards, which vary on location depending on its intended use.

Other proposed indices are oriented towards a particular water use or are constructed for specific areas. Only the National Sanitation Foundation Water Quality Index can be consistently applied to any area and can be quantitatively compared in reporting overall quality trends.

The cummulative form of the NSF - WQI may be written as:

$$WQI(c) = \sum_{i=1}^{n} w_i \, q_i \qquad (1)$$

where

$WQI(c)$ = the cummulative Water Quality Index, a number between 0 and 100

q_i = the quality of the ith parameter, a number between 0 and 100, (read from unit qualigram curves - see appendix A)

w_i = the unit weight of the ith parameter, a number between 0 and 0.17

n = 9, the number of parameters

In the WQI(c) expression above the nine parameters are:

- dissolved oxygen (DO), as percent saturation
- fecal coliform density (FC), no./100 ml
- pH
- nitrates (NO_3), mg/l NO_3-N
- phosphates (PO_4), mg/l PO_4-P
- 5 day biochemical oxygen demand (BOD_5), mg/l

- temperature, °C departure from equilibrium
- total solids, mg/l
- turbidity, JTU (Jackson turbidity units)

This additive model was adequate when all parameters are within a reasonable range, but it lacked sensitivity in forcing the effect of a single low value or poor quality on the overall water quality. As a result, a multiplicative form of the NSF - WQI was developed as:

$$WQI(M) = \prod_{i=1}^{n} q_i^{w_i} \qquad (2)$$

where

WQI(M) = the multiplicative water quality index, a number between 0 and 100 (theoretical),

q_i = the quality of the ith parameter, a number between 0 and 100,

w_i = the unit weight of the ith parameter, a number between 0 and 0.17

n = the number of parameters.

The computer programs:

Three distinct programs will be described:

a) The reporting and graphical display of the cummulative or multiplicative NSF - WQI for the retrieved STORET stations, as a function of time.

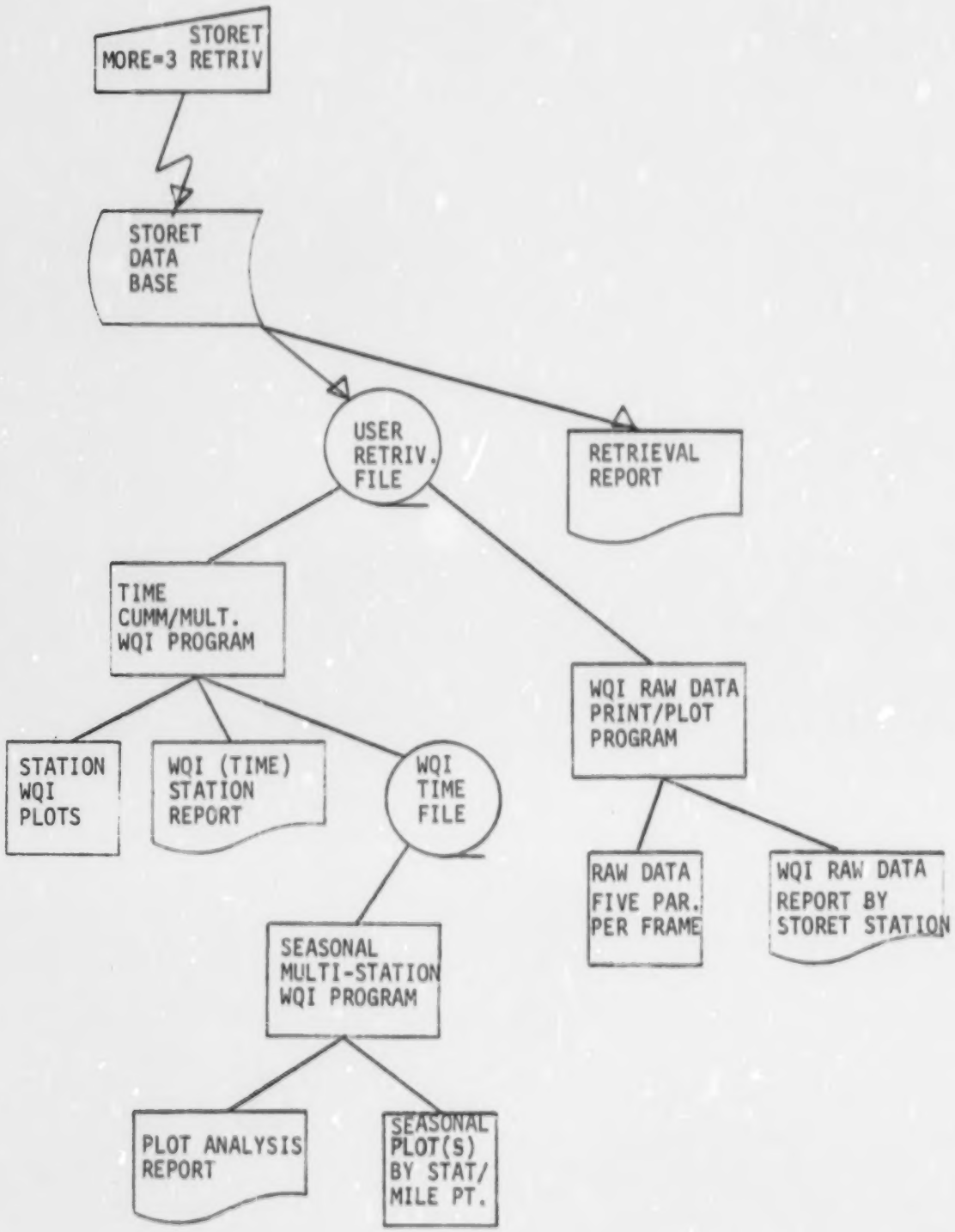
b) The reporting and graphical display of the parameters used to compute the NSF - WQI, by plotting five parameters to a frame as a function of time.

c) The graphical display of the NSF - WQI for specified time intervals versus STORET station numbers or station mile points.

The graphical output is generated by calling subroutines of the Integrated Plotting Package. This procedure creates a neutral text of instructions, which are subsequently processed as line printer plots, or as calcomp digital plots or by using the Time Sharing Option at OSI, the plot can be created interactively on the 4014 Tektronics terminal.

Figure 1

SYSTEM FLOWCHART OF NSF-WQI GRAPHICS FROM STORET DATA BASE



-6-

PROGRAM A: PLOT/PRINT NSF - WQI TIME PROFILE FOR STORET STATIONS

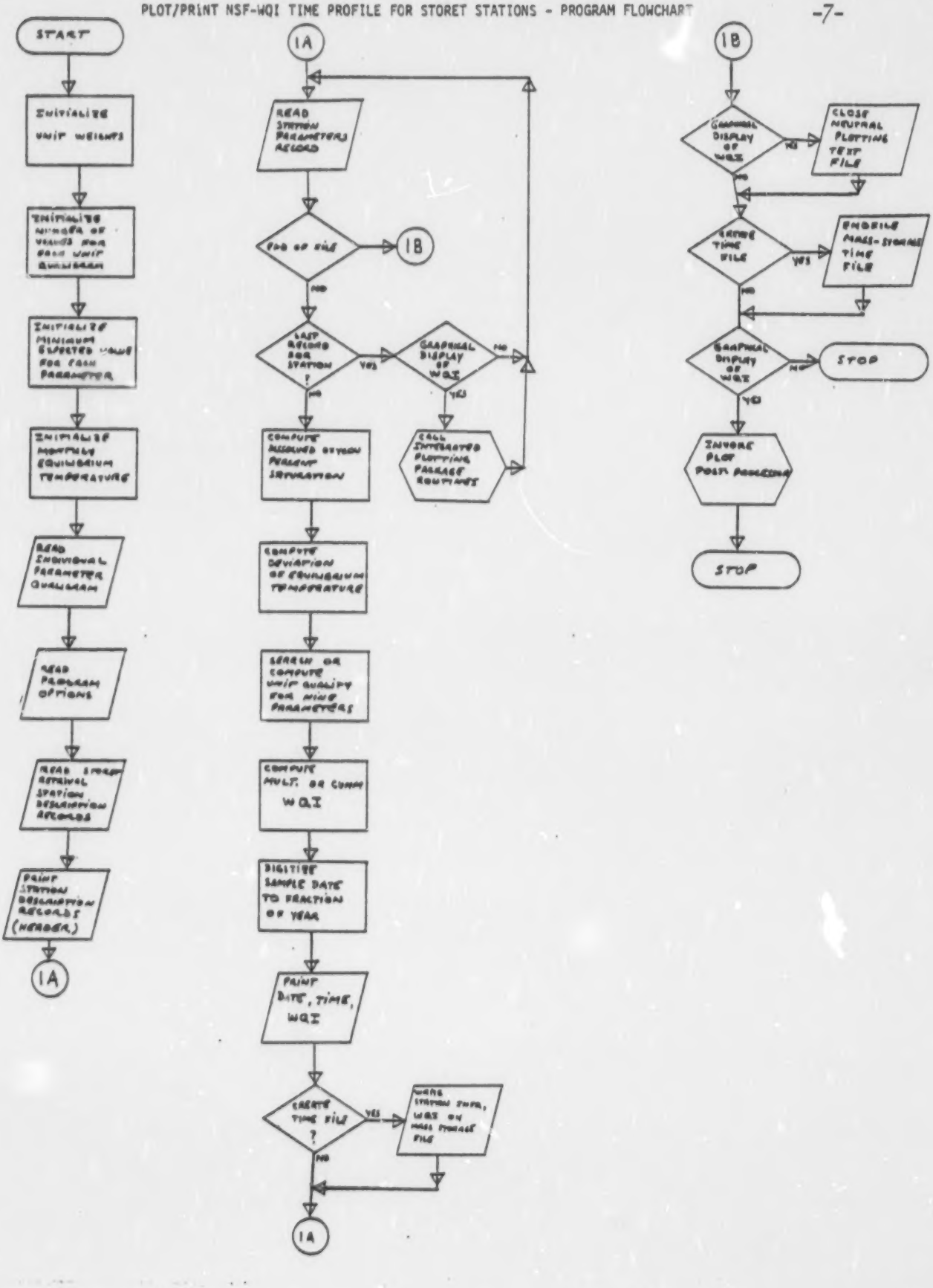
This program reads input from a STORET "More = 3" retrieval and computes multiplicative or cummulative water quality indices and outputs these on a report format. The user can also direct the program to produce printer or calcomp plots, by modifying Job Control statements. The program has been written in a general form so that it may be applied with very minor modifications anywhere in the United States.

The program begins by setting monthly equilibrium temperatures for the given area[5], then reads control options specified by the user and the digitized unit qualigrams. Then the first station in the storet retrieval is processed. If all the nine parameters used in the index are not present, the data for this date/time record is bypassed. Observations with all parameters present are first edited so that extraneous values (if present) are eliminated. The the saturation level of oxygen is computed using temperature and chloride concentration, from this value the dissolved oxygen concentration as % saturation is arrived. Next, the deviation from equilibrium temperature is computed.

If the unit quality of a parameter falls in between two defined values, a linear interpolation is performed to compute the unit quality for the parameter. Once all nine unit qualities are known a cummulative or multiplicative index is computed. Then the sample date is digitized to a fraction of the year. These two values; the index and the digitized date are then saved in a vector for plotting. The program then goes to the next date/time observation and performs these same operations. Once the last record for this station is processed, the program breaks control and calls Integrated Plotting routines. These routines create a so-called "neutral-text" on a mass storage file and returns to process the next station as outlined above.

Once all the stations have been processed, a plot post-processor is invoked which will produce a printer-plot, a calcomp plot or if interactively, a Tektronics CRT display.

PLOT/PRINT NSF-WQI TIME PROFILE FOR STORET STATIONS - PROGRAM FLOWCHART



PROGRAM A: PLOT/PRINT NSF-WQI TIME PROFILE FOR STORET STATIONS

PROGRAM INPUT

(1) TO UPDATE PROGRAM WITH EQUILIBRIUM TEMPERATURES:
If necessary, change source statement number 53 to the applicable equilibrium temperatures. Reference no. 5 has tables listing these values applicable to most locations in the United States.

(2) TO MODIFY DIGITIZED UNIT QUALIGRAMS FOR PARAMETERS:
The data shown on page 10 is for linear approximations to the mean curve of the unit qualigrams for each of the nine parameters as shown on Appendix A. This data is provided with the program. If the user desires to improve these values, first modify source statement number 37 to the new number values to be read for each parameter, then read these values as follows:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 10	TABLE (1,1,1)	F10.0	1st value of x-scale for 1st parameter
11 - 20	TABLE (2,1,1)	F10.0	2nd value of x-scale for 1st parameter
.	.	.	.
.	.	.	.
.	.	.	.
71 - 80	TABLE (8,1,1)	F10.0	8th value of x-scale for 1st parameter

The card above is repeated until all x-scale values for the 1st parameter unit qualigrams have been read.

The y-values (unit qualities) for the corresponding x-values read above are now entered:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 10	TABLE (1,2,1)	F10.0	corresponding 1st value of y-scale for 1st parameter
11 - 20	TABLE (2,2,1)	F10.0	corresponding 2nd value of y-scale for 1st parameter
.	.	.	.
.	.	.	.
.	.	.	.
71 - 80	TABLE (8,2,1)	F10.0	8th value of y-scale for 1st parameter

This card above is repeated (if necessary) until all corresponding y values for the x-values read in previously have been entered.

Next the x-values and the associated unit quality for the 2,3...9 parameters are entered in an identical manner. For the last parameter this input would be:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 10	TABLE (1,1,9)	F10.0	1st value of x-scale for 9th parameter
11 - 20	TABLE (2,1,9)	F10.0	2nd value of x-scale for 9th parameter
.	.	.	.
.	.	.	.
.	.	.	.
71 - 80	TABLE (8,1,9)	F10.0	8th value of x-scale for 9th parameter

As previously, the above card is repeated if necessary.

Next the y-values for the corresponding x-values are entered:

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 10	TABLE (1,2,9)	F10.0	corresponding 1st value of y-scale for 9th parameter
11 - 20	TABLE (2,2,9)	F10.0	corresponding 2nd value of y-scale for 9th parameter
.	.	.	.
.	.	.	.
.	.	.	.
71 - 80	TABLE (8,2,9)	F10.0	corresponding 8th value of y-scale of 9th parameter

Again, as in the first parameter, the above card is repeated if it was necessary in inputting the x-scale for this parameter.

3) PROGRAM OPTIONS CARD

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 2	OPTION (1)	I2	OPTION (1) = 0 for CUMM WQI OPTION (1) > 0 for MULT WQI
3 - 4	OPTION (2)	I2	OPTION (2) = 0, REPORT ONLY OPTION (2) > 0, PRINT REPORT AND ALSO PLOT
5 - 6	OPTION (3)	I2	OPTION (3) > 0 TO CREATE TIME FILE USED IN MULTI-STATION WQI PROGRAM (SEE FORTRAN FILE 25) IN JCL STATEMENTS

4) STORET "MORE = 3" RETRIEVAL

This retrieval must precede this program, and is referenced in the JCL statements as "fortran file (20)", see sample deck set up in the following section.

SAMPLE INPUT

1) Deck set-up for program execution from source statements:

```
//IIIWQI JOB (AAAA,III,1,5)
//  EXEC IPPPRCGP,REGION=130K
//*  THIS PROCEDURE WILL INVOKE THE PRINTER POST-PROCESSOR
//FORT.SYSIN DD *
        .                       .                       .
        .                       .                       .
        .                       .                       .
              S O U R C E   P R O G R A M   G O E S   H E R E
        .                       .                       .
        .                       .                       .
        .                       .                       .
//GO.FT20F001 DD UNIT=3330,VOL=SER=TS0001,DISP=(OLD,KEEP),
//  DSNAME=CNAAAA.III.(FILE NAME FROM STORET RETRIEVAL FOLLOWS)
//GO.FT25F001 DD UNIT=3330,VOL=SER=TS0001,DISP=(NEW,KEEP),
// DCB=(RECFM=FB,LRECL=99,BLKSIZE=12969),SPACE=(TRK,(5,1),RLSE),
//  DSNAME=CNA4AA.III.(TIME FILE NAME GOES HERE)
//GO.FT08F001  DD *
  0.0      20.0     30.0     40.0     50.0     60.0     78.0     80.0
  100.0    120.0    140.0
  3.0      12.0     20.0     30.0     44.0     60.0     75.0     86.0
  100.0    89.0     73.0
  1.0      2.0      5.0      10.0     20.0     50.0     100.0    300.0
  500.0    1000.0   2000.0   5000.0   10000.0  20000.0  100000.0
  100.0    88.0     77.0     68.0     58.0     47.0     40.0     30.0
26.0       21.0     18.0     12.0     9.0      7.0      5.0
  2.0      3.0      3.3      4.0      4.5      5.0      5.5      6.0
  6.4      7.0      7.2      7.4      7.8      8.0      8.5      9.0
  10.0     10.5     11.0     12.0
  2.0      4.0      7.0      10.0     16.0     27.0     42.0     62.0
80.0       91.0     93.0     94.0     90.0     87.0     80.0     45.0
  18.0     10.0     6.0      3.0
  0.0      5.       10.      15.       20.     25.      30.
 100.      53.      31.      18.      11.      7.       5.
 0.0       5.0      10.      20.       30.      40.      50.      60
  70.      80.      90.      100.
  100.      66.     49.      32.      23.      17.      12.      7.
 4.        2.0      1.2      1.1
  0.0      .5       1.       2.       3.       4.        5.      6.
 7.        8.       9.       10.
 100.      60.      41.      25.      18.      12.       10.      8.
 7.        6.       5.       4.
 0.0      1.25     2.5      5.0      6.25     7.5      8.9      10.0
 12.5     15.0     17.5     20.0
  52.0    71.0     81.0     93.0     86.0     76.0     50.0     40.0
  26.0    18.0     12.0     9.0
 0.0       10.      20.      30.      40.      50.      60.      70.
 80.       90.      100.
 100.      77.      62.      52.      44.      38.       32.      28.
 24.       20.      17.
0.0        50.      100.     150.     200.     250.     300.     350.
 400.      450.     500.
 80.       86.      84.      81.      74.      68.      61.      54.
 47.        39.     33.
000101

/*
```

2) Execution of program from load module:

```
//AIIIWQI JOB (AAAA,III,1,5)
//S1 EXEC PGM=TIMEWQI,REGION=130K
//STEPLIB DD DSN=CNR2TW.GAN.WQI.LOADLIB,DISP=SHR
//FT02F001 DD DSN=&IPPTAPE,UNIT=SYSDA,SPACE=(CYL,(2,2),RLSE),
// DCB=(RECFM=VBS,LRECL=516,BLKSIZE=3156),DISP=(NEW,PASS,DELETE)
//FT06F001 DD SYSOUT=A
//FT20F001 DD UNIT=3330,VOL=SER=TS0001,DISP=(OLD,KEEP),
//  DSNAME=CNAAAA.III.(FILE NAME FROM STORET RETRIEVAL FOLLOWS)
//FT25F001 DD UNIT=3330,VOL=SER=TS0001,DISP=(NEW,KEEP),
// DCB=(RECFM=FB,LRECL=99,BLKSIZE=12969),SPACE=(TRK,(5,1),RLSE),
//  DSNAME=CNAAAA.III.(TIME FILE NAME GOES HERE)
//FT08F001 DD *
  0.0      20.0      30.0      40.0      50.0      60.0      78.0      80.0
  100.0    120.0     140.0
  3.0      12.0      20.0      30.0      44.0      60.0      75.0      86.0
  100.0    89.0      73.0
  1.0      2.0       5.0       10.0      20.0      50.0      100.0     300.0
  500.0    1000.0    2000.0    5000.0    10000.0   20000.0   100000.0
  100.0    88.0      77.0      68.0      58.0      47.0      40.0      30.0
26.0       21.0      18.0      12.0      9.0       7.0       5.0
  2.0      3.0       3.3       4.0       4.5       5.0       5.5       6.0
  6.4      7.0       7.2       7.4       7.8       8.0       8.5       9.0
  10.0     10.5      11.0      12.0
  2.0      4.0       7.0       10.0      16.0      27.0      42.0      62.0
80.0       91.0      93.0      94.0      90.0      87.0      80.0      45.0
  18.0     10.0      6.0       3.0
  0.0      5.        10.       15.       20.       25.       30.
 100.      53.       31.       18.       11.       7.        5.
 0.0       5.0       10.       20.       30.       40.       50.       60.
  70.      80.       90.       100.
  100.      66.      49.       32.       23.       17.       12.       7.
 4.        2.0       1.2       1.1
  0.0      .5        1.        2.        3.        4.        5.        6.
 7.        8.        9.        10.
 100.      60.       41.       25.       18.       12.       10.       8.
 7.        6.        5.        4.
 0.0       1.25      2.5       5.0       6.25      7.5       8.9       10.0
 12.5      15.0      17.5      20.0
  52.0     71.0      81.0      93.0      86.0      76.0      50.0      40.0
  26.0     18.0      12.0      9.0
 0.0       10.       20.       30.       40.       50.       60.       70.
 80.       90.       100.
 100.      77.       62.       52.       44.       38.       32.       28.
 24.       20.       17.
0.0        50.       100.      150.      200.      250.      300.      350.
 400.      450.      500.
 80.       86.       84.       81.       74.       68.       61.       54.
 47.        39.      33.
010101

/*
//PLOT EXEC PGM=*******,COND=(8,LE),REGION=130K
//*  IN THE PREVIOUS STATEMENT, REPLACE ****** WITH
//*        CCMP1136   FOR CALCOMP POSTPROCESSOR.
//*        PRINTER    FOR PRINTER POSTPROCESSOR.
//STEPLIB DD DSN=CNSSSS.ZAF.IPP.LOAD1,DISP=SHR
//FT01F001 DD DDNAME=SYSIN
//FT02F001 DD DSN=&IPPTAPE,DISP=(OLD,DELETE,DELETE)
//FT06F001 DD SYSOUT=A
//FT15F001 DD SYSOUT=A
//* USE THE NEXT THREE STATEMENTS WITH CALCOMP POSTPROCESSOR ONLY.
//FT03F001 DD DDNAME=PLOTTAPE
//PLOTTAPE DD DSN=IPPTAPE,UNIT=(2400,,DEFER),VOL=SER=TTTTTT,
// LABEL=(1,SL),DCB=DEN=2,DISP=(MOD,KEEP)
/*
```

WHERE

AAAA IS THE USER'S ACCOUNT NUMBER

III IS THE USER'S INITIALS

TTTTTT IS THE MAGNETIC TAPE NUMBER

PROGRAM A: PLOT/PRINT NSF - WQI TIME PROFILE
FOR STORET STATIONS

SAMPLE OUTPUT

STATION 340028

340028 170
40 55 16.0 074 50 27.0 2
PEQUEST RIVER
34 NEW JERSEY
NORTH ATLANTIC 020392
DELAWARE RIVER
21NJDEP1 2111204
0000 FEET DEPTH CLASS 00

DATE	DIG. YR.	TIME	CURM WQI
8/22/66	0.641		64.
10/31/66	0.833		73.
6/21/67	0.471		73.
9/26/67	0.737		71.
11/20/67	0.884		71.
1/23/68	0.063		74.
4/16/68	0.292		72.
8/20/68	0.637		73.
12/ 2/68	0.921		73.
3/11/69	0.192		76.
5/27/69	0.403	1100	75.
12/17/69	0.962	1038	75.
3/ 5/70	0.175	1045	76.
5/ 4/70	0.340		69.
11/16/70	0.877	1015	66.
2/ 9/71	0.110	1045	69.
5/11/71	0.359	1030	70.
9/ 8/71	0.688	1100	75.
12/ 7/71	0.934	1040	72.
3/ 9/72	0.189	1045	77.
6/14/72	0.454	1230	74.
10/18/72	0.798		74.
3/ 6/73	0.178		74.
5/16/73	0.373		72.
10/ 1/73	0.751		77.
12/11/73	0.945		70.

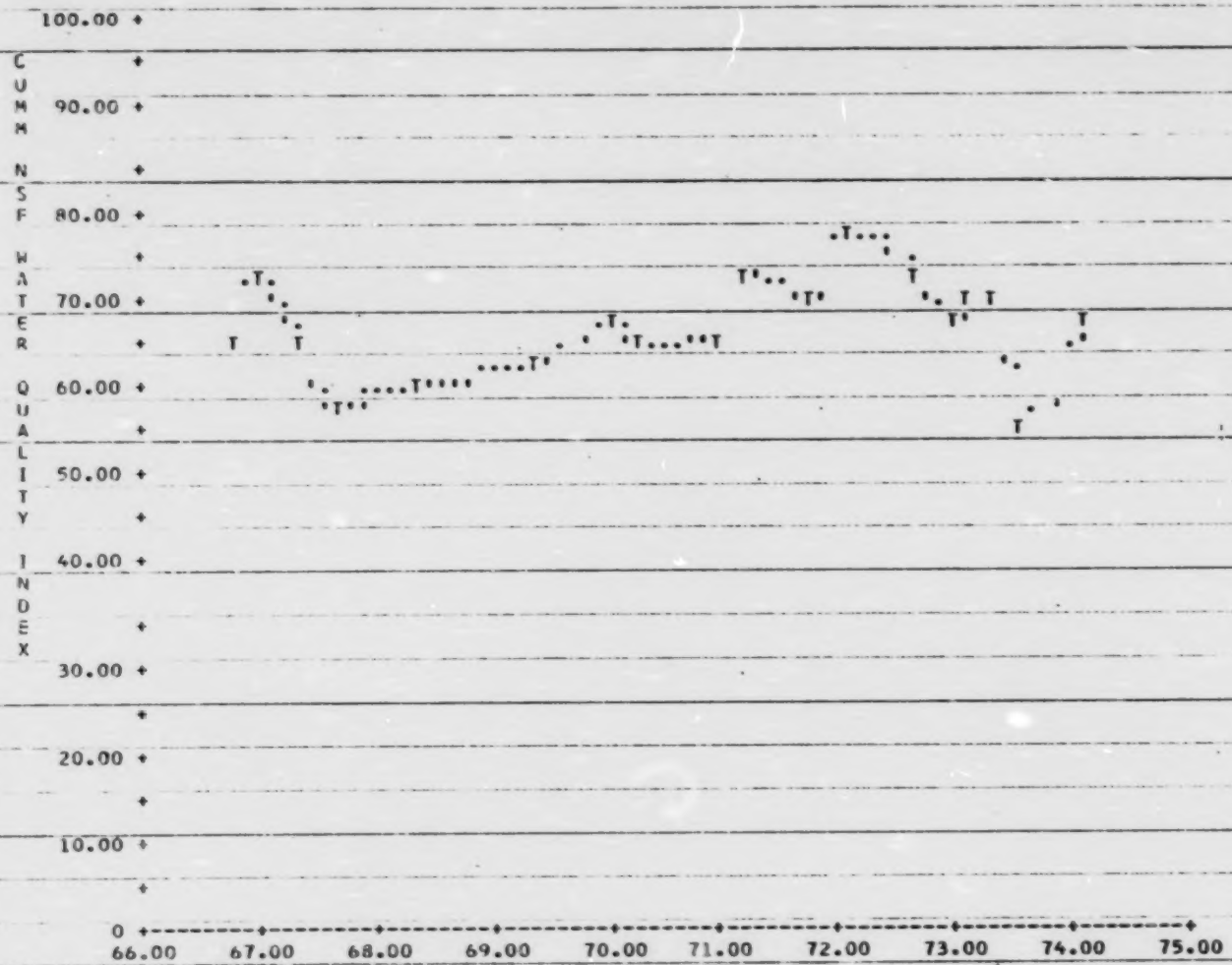
STATION 341004

341004 4
40 04 52.0 074 09 07.0 2
METEDECONK RIVER N. BRANCH
34 NEW JERSEY
NORTHEAST
NEW JERSEY COASTAL
21NJDEP1 2111204
0000 FEET DEPTH CLASS 00

DATE	DIG. YR.	TIME	MULT WQI
11/22/66	0.893		77.
2/28/67	0.162		83.
9/13/67	0.701		62.
11/ 1/67	0.836		66.
6/ 4/68	0.426		59.
8/ 1/68	0.585	1310	49.
10/22/68	0.809		59.
1/22/70	0.060		77.
3/16/70	0.205	1300	67.
3/29/71	0.241	1245	77.
1/19/72	0.052	1310	78.
1/19/72	0.052		78.
4/10/72	0.276	1245	72.
4/10/72	0.276		72.
12/12/72	0.948		79.
2/20/73	0.140		83.
5/ 7/73	0.348		71.
9/24/73	0.732		60.
12/ 5/73	0.929		64.
1/14/74	0.038		74.

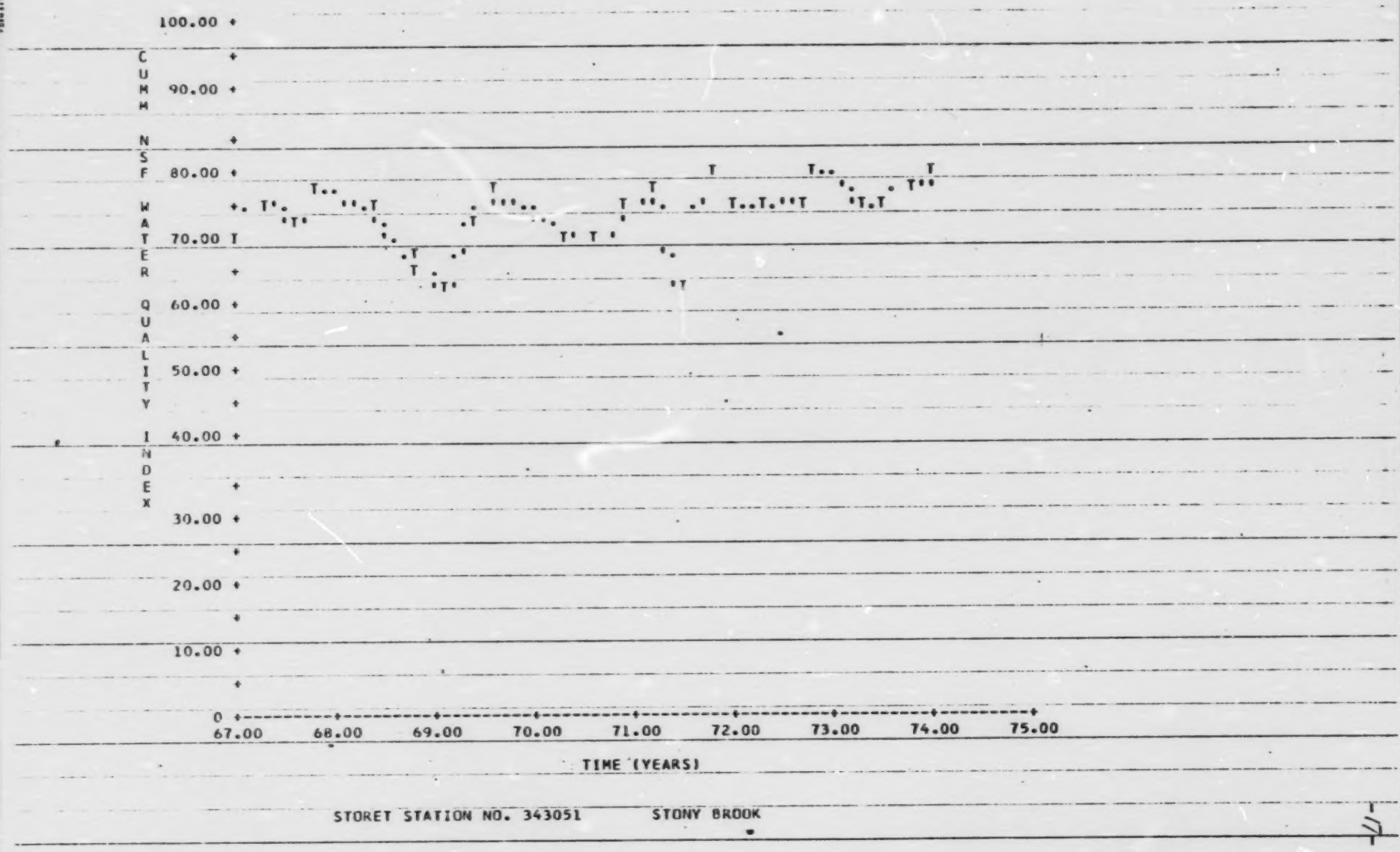
```
P R I N T E R   P O S T P R O C E S S O R   OF IPP    - COMMENTS AND ERROR MESSAGES -     VERSION 01 MAY 74

FRAME NUMBER    1 STARTING WITH RECORD NUMBER      1
FRAME NUMBER    1 PROCESSED WITH    0 ERRORS DETECTED

SUMMARY
          RECORDS    67
          FRAMES      1
          ERRORS      0

END OF POSTPROCESSOR RUN FOR IPP
```

PANEL 1 FRAME 6



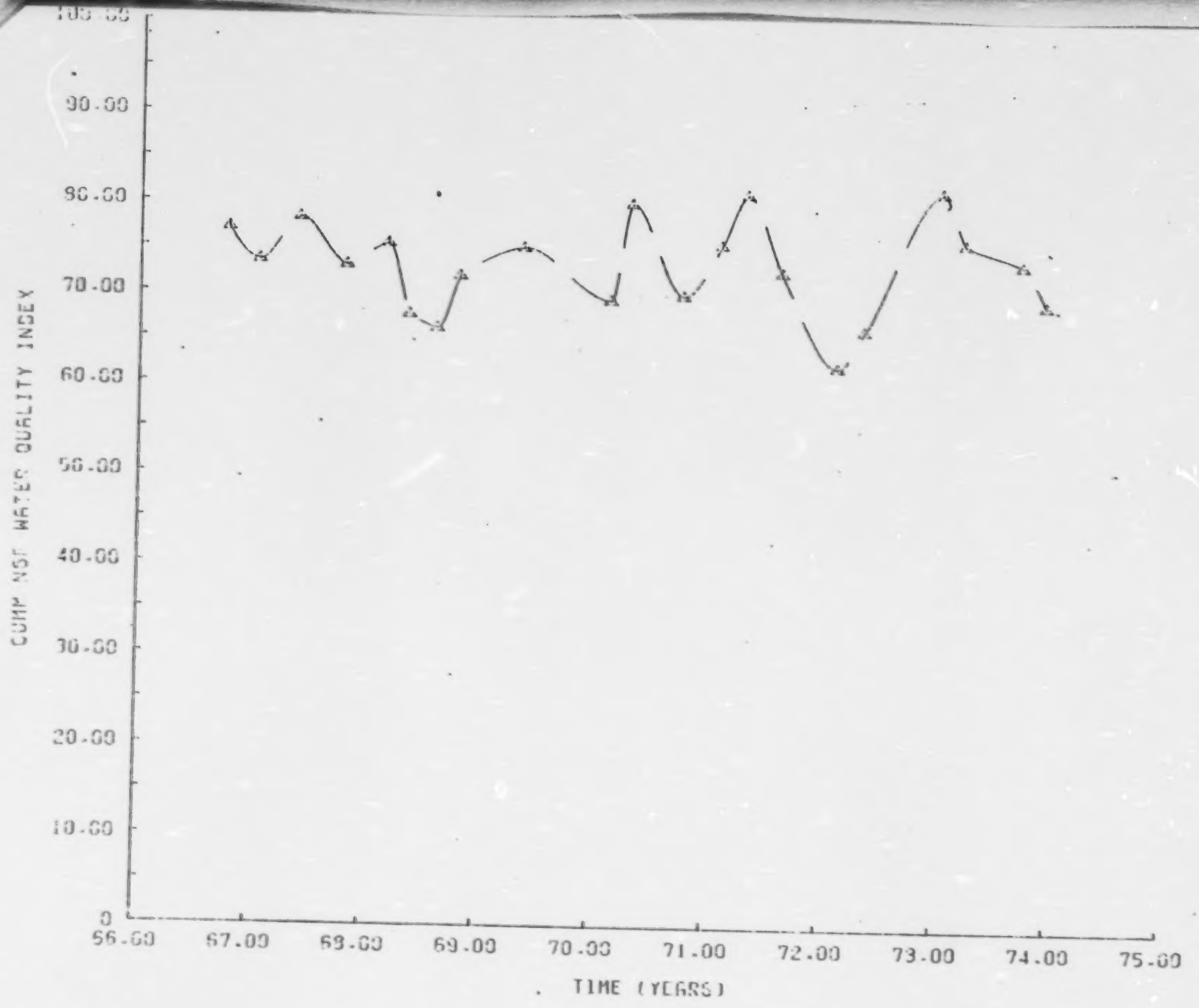
STORET STATION NO. 343045 MILLSTONE RIVER

PANEL 1 FRAME 8

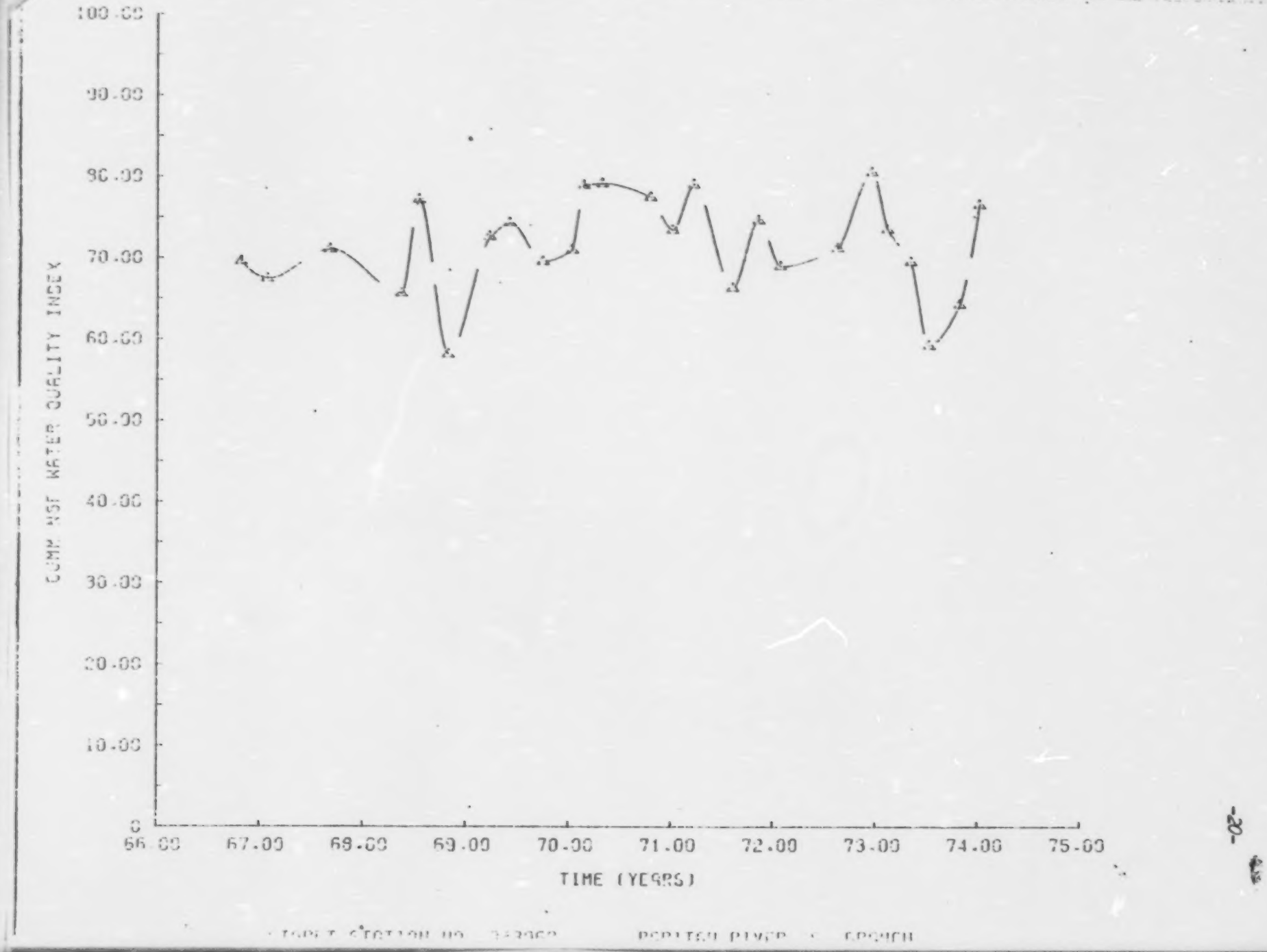


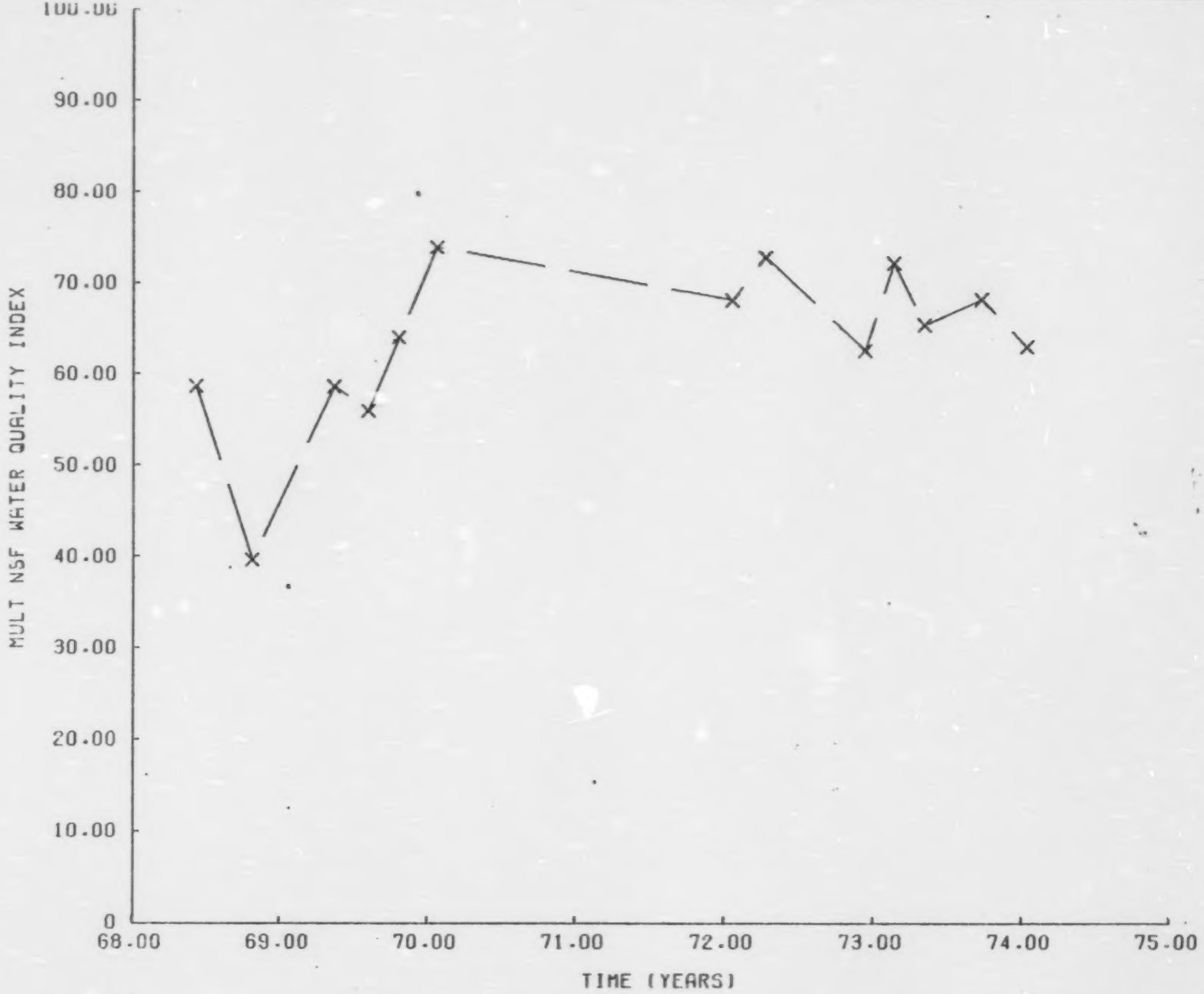
STORET STATION NO. 343051 STONY BROOK

```
C A L C O M P  P O S T P R O C E S S O R  OF IPP    - COMMENTS AND ERROR MESSAGES -    VERSION 01 MAY 74

FRAME NUMBER     1 STARTING WITH RECORD NUMBER       1
FRAME NUMBER     1 PROCESSED WITH     0 ERRORS DETECTED

SUMMARY

          RECORDS     77
          FRAMES       1
          ERRORS       0

END OF POSTPROCESSOR RUN FOR IPP
```

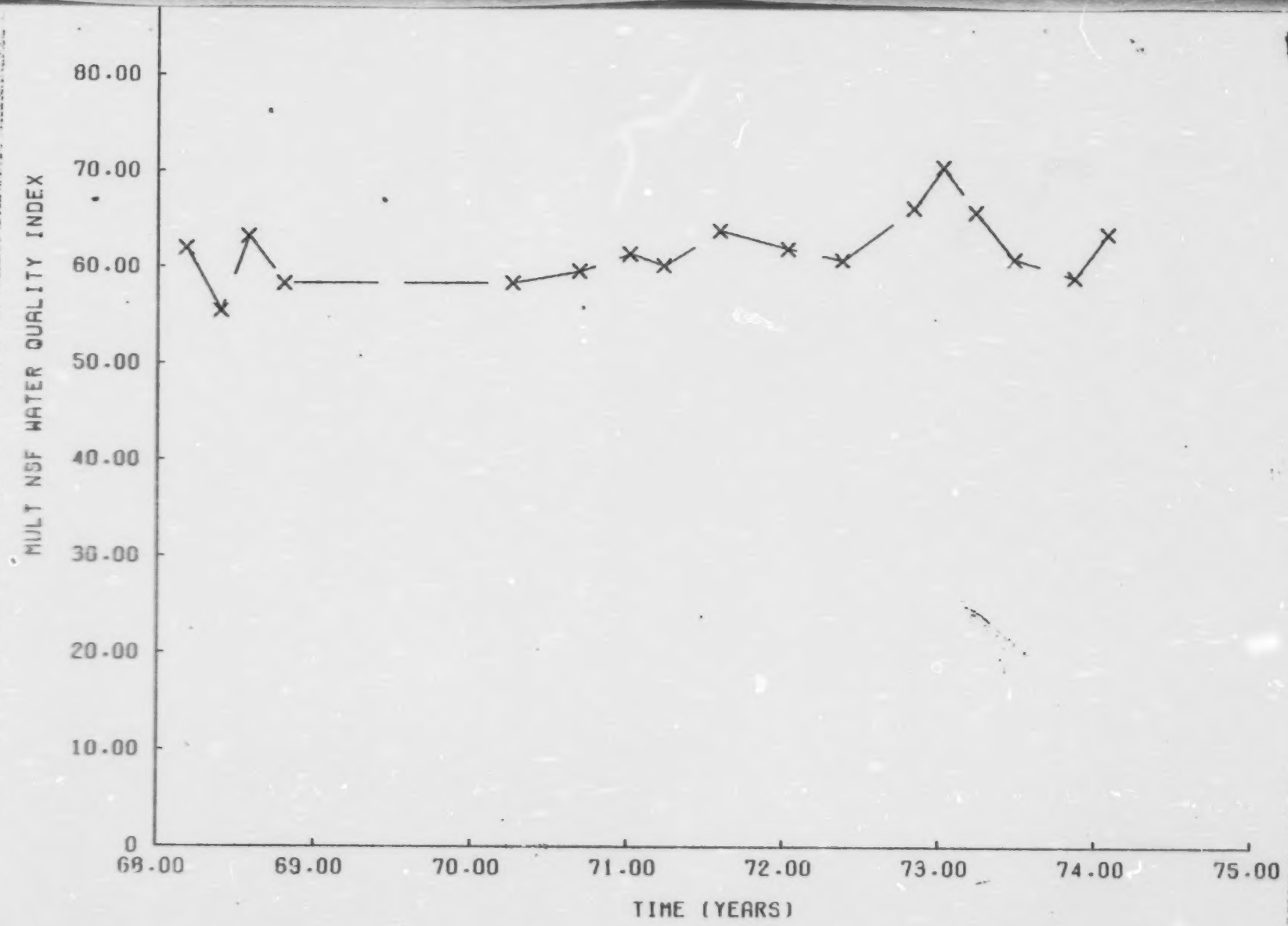


STORET STATION NO. 343014 RARITAN RIVER (R14)


100.00
90.00
80.00
70.00
60.00
50.00
40.00
30.00
20.00
10.00
0
COMP NSF WATER QUALITY INDEX
66.00
67.00
68.00
69.00
70.00
71.00
72.00
73.00
74.00
75.00
TIME (YEARS)



STORET STATION NO. 341007 TOMS RIVER RIDGEWAY BRANCH



STORET STATION NO. 341008 WADING RIVER W. BRANCH

PROGRAM A - SOURCE LISTING

```
C                                                                       TWQI000
C     ***************************************************************** TWQI001
C     ***************************************************************** TWQI002
C                                                                       TWQI003
C     GENERALIZED NSF WATER QUALITY INDEX PROGRAM                       TWQI004
C                                                                       TWQI005
C     *** USER SPECIFIES CUMMULATIVE OR MULTIPLICATIVE INDEX ***        TWQI006
C                                                                       TWQI007
C     *** OPTIONNAL GRAPHS ON PRINTER OR DIGITAL PLOTTER ***            TWQI008
C                                                                       TWQI009
C     ***************************************************************** TWQI010
C     ***************************************************************** TWQI011
C                                                                       TWQI012
      INTEGER OPTION(3)                                                 TWQI013
      DIMENSION PLDATA(30),SYMBOL(14),XXVAL(100),YYVAL(100),SCL(5)      TWQI014
      DIMENSION TOP(12),TABLE(20,2,9),MAXX(9),WEIGHT(9),QMAX(9)         TWQI015
      DIMENSION AGENCY(2),DESCRP(30),EQTEMP(12),PARAM(10),SMALL(9),     TWQI016
     1QUAL(9),STAT(4),DAYS(12),HSTAT(4)                                 TWQI017
      DIMENSION BUFX(500),BUFY(500)                                     TWQI018
C     ***************************************************************** TWQI019
C                                                                       TWQI020
C     THE NEXT STATEMENT HAS THE UNIT WEIGHT FACTORS FOR EACH PARAMETER TWQI021
C                                                                       TWQI022
C     ***************************************************************** TWQI023
      DATA WEIGHT/.17,.15,.12,.10,.10,.10,.10,.08,.08/                  TWQI024
C     ***************************************************************** TWQI025
C                                                                       TWQI026
C     THIS NEXT DATA STATEMENT HAS THE MAXIMUM NO. OF POINTS IN EACH    TWQI027
C     UNIT QUALIGRAM  --  FOR PROGRAM CONTROL                           TWQI028
C                                                                       TWQI029
C     ***************************************************************** TWQI030
      DATA MAXX/11,15,20,7,12,12,12,11,11/                              TWQI031
      DATA DAYS/31.,28.,31.,30.,31.,30.,31.,31.,30.,31.,30.,31./        TWQI032
      DATA SKPTIM/'2500'/,SPACE/'    '/                                 TWQI033
      DATA SMALL/0.,1.,2.,0.,0.,0.,-10.,0.0,0.0/                        TWQI034
      DATA SYMBOL/'Q','O','T','+','X','D','A','M','Z','Y','B','*','H','I TWQI035
     1'/                                                                TWQI036
C     ***************************************************************** TWQI037
C                                                                       TWQI038
C     THE NEXT DATA STATEMENT IS THE UNIT QUALITY, ASSIGNED TO A        TWQI039
C     PARAMETER EXCEEDING THE RANGES IN THE QUALIGRAMS                  TWQI040
C                                                                       TWQI041
C     ***************************************************************** TWQI042
      DATA QMAX/50.,2.,0.0,2.,1.,2.,5.,5.,20./                          TWQI043
C                                                                       TWQI044
C     ***************************************************************** TWQI045
C                                                                       TWQI046
C     THESE NEXT VALUES ARE MONTHLY EQUILIBRIUM TEMPERATURES FOR THE    TWQI047
C     STATE OF NEW JERSEY   REF  'EFFECT OF GEOGRAPHICAL LOCATION ON    TWQI048
C     COOLING POND REQUIREMENT AND PERFORMANCE 16130 FDQ 03/71          TWQI049
C                                                                       TWQI050
C     ***************************************************************** TWQI051
      DATA EQTEMP/33.,37.,45.,57.,69.,78.,83.,81.,73.,60.,46.,38./      TWQI052
C                                                                       TWQI053
```

PROGRAM A - SOURCE LISTING

```
      M=8                                                                TWQI054
C     ******************************************************************* TWQI055
C                                                                        TWQI056
C     READ INDIVIDUAL PARAMETER QUALIGRAMS                               TWQI057
C                                                                        TWQI058
C     ******************************************************************* TWQI059
      DO 150  I=1,9                                                      TWQI060
      MAX=MAXX(I)                                                        TWQI061
C                                                                        TWQI062
C     FIRST -- THE X-SCALE IS READ INTO TABLE(J,1,I)                     TWQI063
C                                                                        TWQI064
      READ(M,151)(TABLE(J,1,I),J=1,MAX)                                  TWQI065
  151 FORMAT(8F10.0)                                                     TWQI066
C                                                                        TWQI067
C     NOW READ IN THE ASSOCIATED Y VALUE FOR THE X'S ABOVE               TWQI068
C                                                                        TWQI069
      READ(M,151)(TABLE(J,2,I),J=1,MAX)                                  TWQI070
  150 CONTINUE                                                           TWQI071
      ISEQ=0                                                             TWQI072
C                                                                        TWQI073
C     'ISEQ' IS USED TO IDENTIFY STORET STATIONS BY A UNIQUE SEQUENTIAL  TWQI074
C     NUMBER ... USED IF PLOTTING SEASONAL WQI BY MILE PTS. OR STAT. NO. TWQI075
C                                                                        TWQI076
      KK=0                                                               TWQI077
      XXMAX=0.0                                                          TWQI078
      YYMAX=0.0                                                          TWQI079
C                                                                        TWQI080
C     ******************************************************************* TWQI081
C                                                                        TWQI082
C     READ PROGRAM OPTIONS  ...                                          TWQI083
C                                                                        TWQI084
C     OPTION(1)=0, FOR CUMM. INDEX   =1,FOR MULTIPLICATIVE INDEX         TWQI085
C     OPTION(2)=0, FOR NO PLOT,  ... =1,FOR WQI PLOT                     TWQI086
C     OPTION(3)=1, TO CREATE FILE USED IN PLOTTING WQI BY STATIONS       TWQI087
C     IF STATION  PLOTTING WILL NOT FOLLOW  --  LEAVE OPTION(3) BLANK    TWQI088
C                                                                        TWQI089
C     ******************************************************************* TWQI090
      READ(M,101)OPTION                                                  TWQI091
  101 FORMAT(3I2)                                                        TWQI092
C     ******************************************************************* TWQI093
C                                                                        TWQI094
C     CONVERT MONTHLY EQUILIBRIUM TEMPERATURES TO DEGREES CENTIGRADE     TWQI095
C                                                                        TWQI096
C     ******************************************************************* TWQI097
      DO 1  I=1,12                                                       TWQI098
      EQTEMP(I)=(EQTEMP(I)-32.)*.55556                                   TWQI099
    1 CONTINUE                                                           TWQI100
C     ******************************************************************* TWQI101
C                                                                        TWQI102
C **READ DELIMITER RECORD - VERIFY BEGINNING OF DATA RECORDS**           TWQI103
C                                                                        TWQI104
C     ******************************************************************* TWQI105
   12 READ(20,111,END=400) IDUMMY                                        TWQI106
  111 FORMAT(25X,I2)                                                     TWQI107
```

PROGRAM A - SOURCE LISTING

```
      IF (IDUMMY.EQ.99) GOTO 22                                          TWQI108
      GOTO 12                                                            TWQI109
  232 IF(OPTION(2).LE.0)GO TO 432                                        TWQI110
C                                                                        TWQI111
C     GRAPH OF WATER QUALITY INDEX FOR STATION WILL BE DONE IF DESIRED   TWQI112
C                                                                        TWQI113
C     ********************************************************************* TWQI114
C                                                                        TWQI115
C     *** COMMANDS BELOW USE THE INTEGRATED PLOTTING PACKAGE ***         TWQI116
C                                                                        TWQI117
C     ********************************************************************* TWQI118
C                                                                        TWQI119
C     SET INITIAL VALUES ON SPECIFICATIONS ARRAY                         TWQI120
      CALL SSPECS(PLDATA)                                                TWQI121
C                                                                        TWQI122
C     SET PLOTTING SYMBOL DESIRED                                        TWQI123
C                                                                        TWQI124
      PLDATA(16)=SYMBOL(3)                                               TWQI125
C                                                                        TWQI126
C     RESET SIZE OF AXES (INCHES)  Y ONLY                                TWQI127
C                                                                        TWQI128
      PLDATA(8)=7.0                                                      TWQI129
C                                                                        TWQI130
C     MOVE X-AXIS 2 INCHES AWAY FROM ORIGIN                              TWQI131
C                                                                        TWQI132
      PLDATA(2)=2.0                                                      TWQI133
C                                                                        TWQI134
C     ENTER NUMBER OF DATA POINTS TO PLOT                                TWQI135
C                                                                        TWQI136
      PLDATA(13)=MM-1                                                    TWQI137
C                                                                        TWQI138
C     CLEAR WORK AREA                                                    TWQI139
C                                                                        TWQI140
      DO 15  K=1,5                                                       TWQI141
   15 SCL(K)=0.0                                                         TWQI142
C                                                                        TWQI143
C     SET RANGE OF VALUES ON X-AXIS,  NO. DIVISIONS=NO. YEARS ANALYZED   TWQI144
C                                                                        TWQI145
      KK=XXMAX+1                                                         TWQI146
      PLDATA(3)=KK                                                       TWQI147
      KK2=XXVAL(1)                                                       TWQI148
      PLDATA(4)=KK2                                                      TWQI149
      PLDATA(9)=KK-KK2                                                   TWQI150
C                                                                        TWQI151
C     SET RANGE OF VALUES ON Y-AXIS                                      TWQI152
C                                                                        TWQI153
      PLDATA(5)=100.                                                     TWQI154
      PLDATA(6)=0.0                                                      TWQI155
C                                                                        TWQI156
C     CHANGE DEFAULT VALUE OF DIVISIONS FOR Y-AXIS                       TWQI157
C                                                                        TWQI158
      PLDATA(10) = 10.                                                   TWQI159
C                                                                        TWQI160
C     DRAW ANNOTATION NUMBERS AT THE BOTTOM SCALE MARKS                  TWQI161
```

PROGRAM A - SOURCE LISTING

```
C                                                                       TWQI162
      CALL NODLIB(PLDATA)                                               TWQI163
C                                                                       TWQI164
C     DRAW ANNOTATION NUMBER AT THE LEFT SCALE MARKS                    TWQI165
C                                                                       TWQI166
      CALL NODLIL(PLDATA)                                               TWQI167
C                                                                       TWQI168
C     DRAW  X-Y  AXES ... DOUBLE NO. OF TICK MARKS IN Y-AXIS            TWQI169
C                                                                       TWQI170
      PLDATA(10)=20.0                                                   TWQI171
      CALL AXLILI(PLDATA)                                               TWQI172
C                                                                       TWQI173
CC    CLEAR ZONES VARIABLES --  SINCE UPDATED BY ABOVE SUBROUTINE       TWQI174
C                                                                       TWQI175
      CALL ZZONES(PLDATA)                                               TWQI176
C                                                                       TWQI177
C     PLOT SYMBOL AT DATA POINT LOCATIONS                               TWQI178
C                                                                       TWQI179
      CALL PSLILI(XXVAL,YYVAL,PLDATA)                                   TWQI180
C                                                                       TWQI181
C     NOW CONNECT DATA POINTS WITH PARABOLAS TO FIT THE DATA ...        TWQI182
C                                                                       TWQI183
C                                                                       TWQI184
      CALL PFLILI(XXVAL,YYVAL,BUFX,BUFY,PLDATA)                         TWQI185
C                                                                       TWQI186
C                                                                       TWQI187
C     NOW LABEL THE AXES ......                                         TWQI188
C     CHANGE DEFAULT SPACING OF TITLES TO THE AXES                      TWQI189
C                                                                       TWQI190
      PLDATA(24)=.30                                                    TWQI191
      PLDATA(26)=.75                                                    TWQI192
      CALL TITLEB('+  TIME (YEARS)+',PLDATA)                            TWQI193
      IF(OPTION(1).EQ.0)CALL TITLEL('+CUMM NSF WATER QUALITY INDEX+',   TWQI194
     1PLDATA)                                                           TWQI195
      IF(OPTION(1).NE.0)CALL TITLEL('+MULT NSF WATER QUALITY INDEX+',   TWQI196
     1PLDATA)                                                           TWQI197
C                                                                       TWQI198
C     PRINT GRAPH DESCRIPTION AT LOWER, RIGHT HAND SIDE OF GRAPH        TWQI199
C                                                                       TWQI200
      PLDATA(22)=3.0                                                    TWQI201
      PLDATA(23)=1.0                                                    TWQI202
      CALL GTITLE('+STORET STATION NO.+',PLDATA)                        TWQI203
      PLDATA(22)=4.6                                                    TWQI204
      CALL GTITLE(TOP,PLDATA)                                           TWQI205
C                                                                       TWQI206
C     ADVANCE GRAPH PAPER FOR NEXT STATION                              TWQI207
C                                                                       TWQI208
      CALL NXTFRM(PLDATA)                                               TWQI209
  432 STAT(1)=SPACE                                                     TWQI210
   22 READ(20,30,END=330) AGENCY,STAT,DESCRP                            TWQI211
 30   FORMAT(2A4,4A4,1X,30A4)                                           TWQI212
      MM=1                                                              TWQI213
      WRITE(6,40) STAT,DESCRP                                           TWQI214
 40   FORMAT('1STATION ',4A4,/,' ',30A4)                                TWQI215
```

PROGRAM A - SOURCE LISTING

```
      DO 60 I=1,8                                                        TWQI216
      READ(20,30,END=31C) AGENCY,STAT,DESCRP                             TWQI217
      WRITE(6,50) DESCRP                                                 TWQI218
 50   FORMAT(' ',30A4)                                                   TWQI219
      IF(I.EQ.2)GO TO 61                                                 TWQI220
      GO TO 60                                                           TWQI221
   61 TOP(1)=SYMBOL(4)                                                   TWQI222
      TOP(2)=STAT(1)                                                     TWQI223
      TOP(3)=STAT(2)                                                     TWQI224
      TOP(4)=SPACE                                                       TWQI225
      TOP(5)=DESCRP(17)                                                  TWQI226
      TOP(6)=DESCRP(18)                                                  TWQI227
      TOP(7)=DESCRP(19)                                                  TWQI228
      TOP(8)=DESCRP(20)                                                  TWQI229
      TOP(9)=DESCRP(21)                                                  TWQI230
      TOP(10)=DESCRP(22)                                                 TWQI231
      TOP(11)=DESCRP(23)                                                 TWQI232
      TOP(12)=SYMBOL(4)                                                  TWQI233
C     ********************************************************************TWQI234
C                                                                        TWQI235
C     ADVANCE 'ISEQ' FOR NEXT STATION ...                                TWQI236
C                                                                        TWQI237
C     ********************************************************************TWQI238
      ISEQ=ISEQ+1                                                        TWQI239
 60   CONTINUE                                                           TWQI240
      IF(OPTION(1).EQ.0)WRITE(6,51)                                      TWQI241
      IF(OPTION(1).NE.0)WRITE(6,52)                                      TWQI242
   51 FORMAT(//,31X,'CUMM')                                              TWQI243
   52 FORMAT(//,31X,'MULT')                                              TWQI244
      WRITE(6,70)                                                        TWQI245
 70   FORMAT('   DATE     DIG. YR.   TIME    WQI')                      TWQI246
 80   CONTINUE                                                           TWQI247
      DO 90 I=1,9                                                        TWQI248
      QUAL(I)=0.0                                                        TWQI249
 90   CONTINUE                                                           TWQI250
C     ********************************************************************TWQI251
C                                                                        TWQI252
C     READ STATION PARAMETRIC DATA                                       TWQI253
C                                                                        TWQI254
C     ********************************************************************TWQI255
  100 READ(20,110,END=310) AGENCY,STAT,IYR,IMON,IDAY,TIME,PARAM          TWQI256
  110 FORMAT(2A4,3A4,A3,2X,3I2,A4,10A4)                                  TWQI257
      IF (IYR.EQ.99) GOTO 232                                            TWQI258
      DO 120 I=1,9                                                       TWQI259
C     ********************************************************************TWQI260
C                                                                        TWQI261
C     TEST FOR DUMMY VALUE IF NO SAMPLE WAS TAKEN                        TWQI262
C                                                                        TWQI263
C     ********************************************************************TWQI264
      IF ((PARAM(I).LT.1E-15).AND.(PARAM(I).GT.0.)) GOTO 100             TWQI265
      IF (PARAM(I).GE.0.) GOTO 120                                       TWQI266
      WRITE(6,115) I,PARAM(I)                                            TWQI267
115   FORMAT(' ***WARNING - PARAMETER ',I1,' IS NEGATIVE, ',F3.1         TWQI268
     1,' IS SUBSTITUTED***')                                             TWQI269
```

PROGRAM A - SOURCE LISTING

```
  120 CONTINUE                                                          TWQI270
      IF (TIME.EQ.SKPTIM) TIME=SPACE                                    TWQI271
C     ******************************************************************TWQI272
C                                                                       TWQI273
C     TEST PARAMETERS FOR MINIMUM POSSIBLE VALUES  -- IF LESS ADJUST    TWQI274
C                                                                       TWQI275
C     ******************************************************************TWQI276
      DO 156 I=1,9                                                      TWQI277
      IF (PARAM(I).LT.SMALL(I)) PARAM(I)=SMALL(I)                       TWQI278
  156 CONTINUE                                                          TWQI279
      IF(EQTEMP(IMON)-PARAM(7).LT.-5)PARAM(7)=-5.0                      TWQI280
C     ******************************************************************TWQI281
C                                                                       TWQI282
C     COMPUTE SATURATION LEVEL OF OXYGEN AT STATION  --USING TEMPERATURE TWQI283
C     AND CHLORIDE CONCENTRATION                                        TWQI284
C                                                                       TWQI285
C     ******************************************************************TWQI286
      DOSAT=(1.-.000009*PARAM(10))*(14.652-.41022*PARAM(7)              TWQI287
     1+.007991*PARAM(7)**2 -.000077774*PARAM(7)**3)                     TWQI288
C     ******************************************************************TWQI289
C                                                                       TWQI290
C     COMPUTE OXYGEN CONCENTRATION AS PERCENT SATURATION                TWQI291
C                                                                       TWQI292
C     ******************************************************************TWQI293
       PARAM(1)=PARAM(1)/DOSAT*100.                                     TWQI294
C     ******************************************************************TWQI295
C                                                                       TWQI296
C     COMPUTE DEVIATION FROM EQUILIBRIUM TEMPERATURE                    TWQI297
C                                                                       TWQI298
C     ******************************************************************TWQI299
      PARAM(7)=EQTEMP(IMON)-PARAM(7)                                    TWQI300
C     ******************************************************************TWQI301
C                                                                       TWQI302
C     ADD CONSTANT OF '5' TO TEMPERATURE VALUES -- NOTE - THIS IS DONE  TWQI303
C     TO ELIMINATE NEGATIVE TEMPERATURES IN UNIT QUALIGRAM              TWQI304
C     X-SCALE OF TEMPERATURE QUALIGRAM HAS ALSO BEEN CHANGED ACCORDINGLY TWQI305
C                                                                       TWQI306
C     ******************************************************************TWQI307
      PARAM(7)=PARAM(7)+5.                                              TWQI308
C     ******************************************************************TWQI309
C                                                                       TWQI310
C     SEARCH FOR QUALITY VALUE --  LINEARLY INTERPOLATE IF NECESSARY    TWQI311
C                                                                       TWQI312
C     ******************************************************************TWQI313
      DO 285 IPARAM=1,9                                                 TWQI314
      MAX=MAXX(IPARAM)                                                  TWQI315
      DO 157  ISCAN=1,MAX                                               TWQI316
      IF(PARAM(IPARAM).GT.TABLE(ISCAN,1,IPARAM))GO TO 157               TWQI317
      IF(PARAM(IPARAM).LT.TABLE(ISCAN,1,IPARAM))GO TO 158               TWQI318
      QUAL(IPARAM)=TABLE(ISCAN,2,IPARAM)                                TWQI319
      GO TO 285                                                         TWQI320
  157 CONTINUE                                                          TWQI321
C     ******************************************************************TWQI322
C                                                                       TWQI323
```

PROGRAM A - SOURCE LISTING

```
C     SET QUALITY OF PARAMETER FOR VALUE ABOVE DEFINED MAXIMUM                  TWQI324
C                                                                               TWQI325
C     ***************************************************************************TWQI326
      QUAL(IPARAM)=QMAX(IPARAM)                                                 TWQI327
      GO TO 285                                                                 TWQI328
C     ***************************************************************************TWQI329
C                                                                               TWQI330
C     PARAMETER IS BETWEEN TWO VALUES -- LINEARLY INTERPOLATE FOR UNIT          TWQI331
C     QUALITY BY USING THE HIGH VALUE AND SUBTRACTING THE DIFFERENCE            TWQI332
C                                                                               TWQI333
C     ***************************************************************************TWQI334
  158 XDIF=TABLE(ISCAN,1,IPARAM)-PARAM(IPARAM)                                  TWQI335
      XDELTA=TABLE(ISCAN,1,IPARAM)-TABLE(ISCAN-1,1,IPARAM)                      TWQI336
      SLOPE=(TABLE(ISCAN,2,IPARAM)-TABLE(ISCAN-1,2,IPARAM))/XDELTA              TWQI337
      QUAL(IPARAM)=TABLE(ISCAN,2,IPARAM)-(SLOPE*XDIF)                           TWQI338
285   CONTINUE                                                                  TWQI339
      WQIA=0.                                                                   TWQI340
C     ***************************************************************************TWQI341
C                                                                               TWQI342
C     TEST OPTION OF MULTIPLICATIVE OR ADDITIVE INDEX                           TWQI343
C                                                                               TWQI344
C     ***************************************************************************TWQI345
      IF(OPTION(1).GT.0)GO TO 275                                               TWQI346
      DO 290 I=1,9                                                              TWQI347
      WQIA=WQIA+QUAL(I)*WEIGHT(I)                                               TWQI348
290   CONTINUE                                                                  TWQI349
      GO TO 278                                                                 TWQI350
  275 WQIA=1.0                                                                  TWQI351
      DO 276  I=1,9                                                             TWQI352
      WQIA=WQIA*QUAL(I)**WEIGHT(I)                                              TWQI353
  276 CONTINUE                                                                  TWQI354
C     ***************************************************************************TWQI355
C                                                                               TWQI356
C     DIGITIZE SAMPLE DATE TO FRACTION OF YEAR                                  TWQI357
C                                                                               TWQI358
C     ***************************************************************************TWQI359
  278 SUM=0.                                                                    TWQI360
      IF (IMON.EQ.1) GOTO 675                                                   TWQI361
      INDEX=IMON-1                                                              TWQI362
      DO 670 I=1,INDEX                                                          TWQI363
      SUM=SUM+DAYS(I)                                                           TWQI364
670   CONTINUE                                                                  TWQI365
675   CONTINUE                                                                  TWQI366
      SUM=SUM+IDAY                                                              TWQI367
      IF ((MOD(IYR,4).EQ.0).AND.(IMON.GT.2)) SUM=SUM+1                          TWQI368
      TOTDAY=365                                                                TWQI369
      IF (MOD(IYR,4).EQ.0) TOTDAY=366                                           TWQI370
      FRAC=SUM/TOTDAY                                                           TWQI371
      WRITE(6,300) IMON,IDAY,IYR,FRAC,TIME,WQIA                                 TWQI372
300   FORMAT(' ',I2,'/',I2,'/',I2,4X,F5.3,5X,A4,3X,F4.0)                        TWQI373
C     ***************************************************************************TWQI374
C                                                                               TWQI375
C     SAVE DATE AND WQI FOR PLOTTING OR FOR DISK STATION FILE                   TWQI376
C                                                                               TWQI377
```

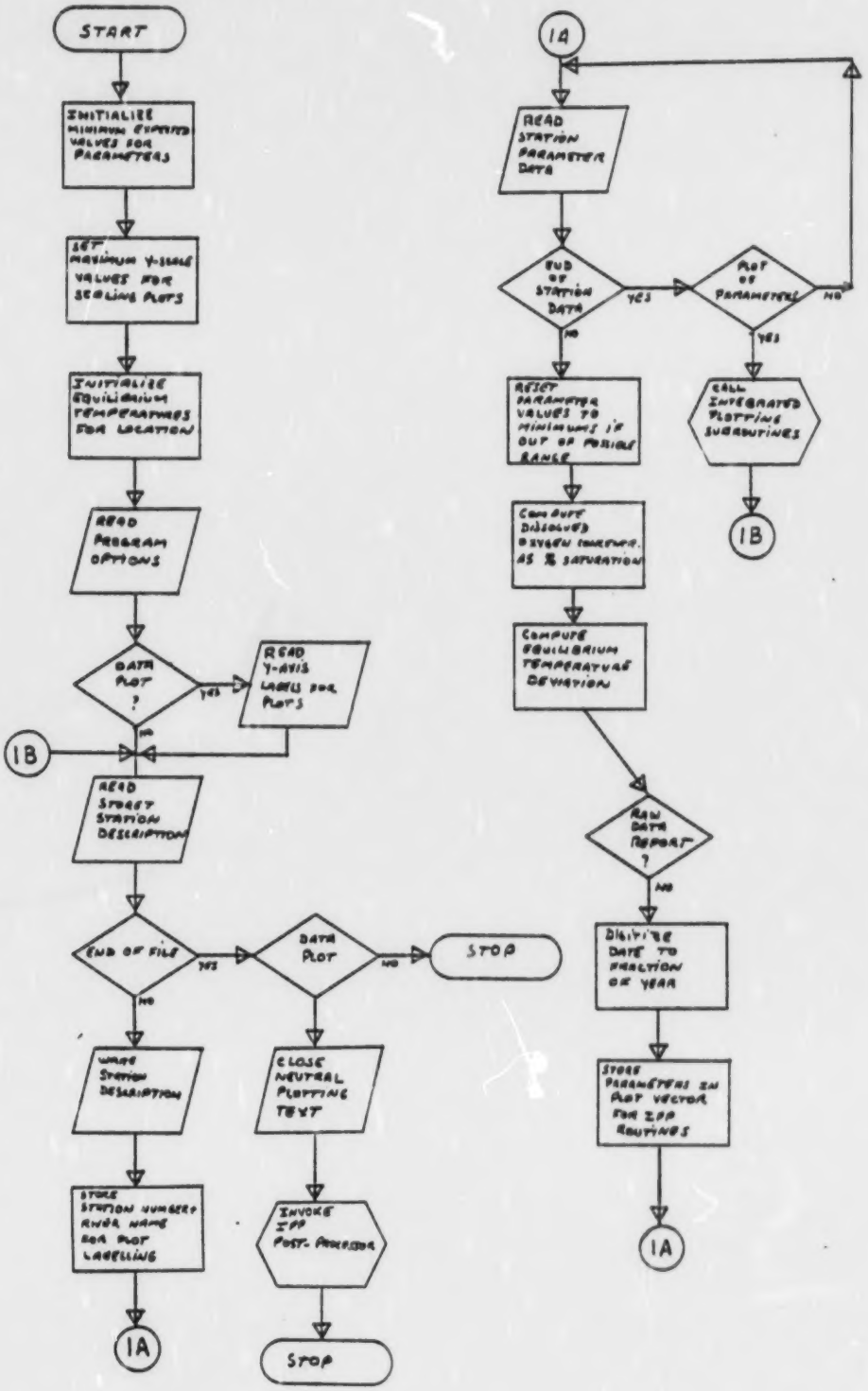
PROGRAM A - SOURCE LISTING

```
C     ********************************************************************** TWQI378
  191 XXVAL(MM)=IYR+FRAC                                                     TWQI379
      YYVAL(MM)=WQIA                                                         TWQI380
C     ********************************************************************** TWQI381
C                                                                            TWQI382
C     SAVE HIGHEST VALUE OF Y-VALUES FOR SCALING PLOT                        TWQI383
C                                                                            TWQI384
C     ********************************************************************** TWQI385
      IF(YYVAL(MM).GT.YYMAX)YYMAX=YYVAL(MM)                                  TWQI386
C     ********************************************************************** TWQI387
C                                                                            TWQI388
C     SAVE HIGHEST OF YEARS FOR SCALING PLOT                                 TWQI389
C                                                                            TWQI390
C     ********************************************************************** TWQI391
      IF(XXVAL(MM).GT.XXMAX)XXMAX=XXVAL(MM)                                  TWQI392
C     ********************************************************************** TWQI393
C                                                                            TWQI394
C     SAVE RECORD ON DISK FILE IF PLOTTING WQI BY STATION                    TWQI395
C                                                                            TWQI396
C     ********************************************************************** TWQI397
      IF(OPTION(3).GT.0)WRITE(25,91)IYR,IMON,IDAY,OPTION(1),STAT,ISEQ        TWQI398
     1,XXVAL(MM),YYVAL(MM),TOP                                               TWQI399
   91 FORMAT(3I2,I2,4A4,I3,2F12.4,12A4)                                      TWQI400
      MM=MM+1                                                                TWQI401
  192 GO TO 100                                                              TWQI402
310   CONTINUE                                                               TWQI403
      WRITE(6,320) STAT                                                      TWQI404
320   FORMAT(//,' ABNORMAL FILE END WHILE READING STATION ',4A4)             TWQI405
      STOP                                                                   TWQI406
400   WRITE(6,112)                                                           TWQI407
  112 FORMAT(10X,'BEGINNING OF DATA RECORDS NOT CONFIRMED')                  TWQI408
  330 IF(OPTION(2).LE.0)GO TO 333                                            TWQI409
C     ********************************************************************** TWQI410
C                                                                            TWQI411
C     PLOTTING IS FINISH  -- NOW CLOSE THE NEUTRAL TEXT                      TWQI412
C                                                                            TWQI413
C     ********************************************************************** TWQI414
      CALL PPPEND(PLDATA)                                                    TWQI415
  333 IF(OPTION(3).GT.0)END FILE 25                                          TWQI416
C     ********************************************************************** TWQI417
C                                                                            TWQI418
C     IF NOT PLOTTING SET HI COND CODE TO  BYPASS PLOT POST-PROCESSOR        TWQI419
C                                                                            TWQI420
C     ********************************************************************** TWQI421
      IF(OPTION(2).LE.0) STOP 40                                             TWQI422
      CALL EXIT                                                              TWQI423
      END                                                                    TWQI424
/*                                                                           TWQI425
```

PROGRAM B: PLOT/PRINT NSF - WQI PARAMETER DATA

This program works quite similar to program A; but instead of computing the WQI, the data for the index is saved in a nine element two dimensional array. The plotting for all the data is done in two frames, by placing five parameters on each frame. As presently written each frame is 10 x 14 inches and due to the high resolution required, it can only be satisfactorily produced on the calcomp plotter. The scale factors for all parameters are set at specified values for ease in comparisons. In applying this program to the State of New Jersey we found two extremes in total dissolved solids concentrations and therefore two sets of scales are used for this parameter.

PLOT/PRINT NSF-WQI PARAMETER DATA - PROGRAM FLOWCHART



PROGRAM B - PLOT/PRINT NSF-WQI PARAMETER DATA

PROGRAM INPUT

1) PROGRAM OPTIONS

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 2	IPRNT	I2	Set > 0, to produce report of WQI Parameter Data
3 - 4	IPLOT	I2	Set > 0, to plot 5 parameters/frame of above data

2) Y-AXIS PARAMETER LABEL (IF IPLOT > 0)

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 20	PTITLE (1,1-5)	5A4	y-axis label for first parameter in character balanced notation (see sample input in next section or reference 2)
1 - 20	PTITLE (2,1-5)	5A4	y-axis label for 2nd parameter
.	.	.	.
.	.	.	.
.	.	.	.
1 - 20	PTITLE (9,1-5)	5A4	y-axis label for 9th parameter

note: The titles above must be in the same sequence as the parameters were specified on the STORET retrieval.

3) STORET "MORE = 3" RETRIEVAL

This retrieval must have preceded as a separate step or as a separate job altogether. In this program it will be referred as input file (20). See deck setup following this section for details.

SAMPLE INPUT

1) Execution of program from source statements:

```
//IIIWQI JOB (AAAA,III,1,5)
//  EXEC IPP1136G,REGION=130K,TAPE=TTTTTT,DISP=NEW
//*  THIS PROCEDURE WILL INVOKE THE CALCOMP POST PROCESSOR
          .                                                    .
          .                                                    .
          .                                                    .
          .                                                    .
                  S O U R C E   P R O G R A M   G O E S   H E R E
          .                                                    .
          .                                                    .
          .                                                    .
          .                                                    .
//GO.FT20F001 DD UNIT=3330,VOL=SER=TS0001,DISP=(OLD,KEEP),
//  DSNAME=CNAAAA.III.(FILE NAME FROM STORET RETRIEVAL FOLLOWS)
//GO.FT08F001  DD *
0101
/D.O.  PERCENT SAT/
+FECAL COLI  MPN/ML+
/      PH       /
+    BOD5  MG/L  +
+     NO3  MG/L  +
+     PO4  MG/L  +
/EQUIL TEMP DELTA /
/  TURBIDITY  JTU /
+ TOT SOLIDS  MG/L+

/*
//PLOT.SYSIN DD DUMMY
/*
```

2) Execution of program from load module:

```
//IIIWQI JO3 (AAAA,III,1,5)
//SO EXEC RINGIN,VOLS=TTTTTT
/*
//S1 EXEC PGM=FIVEPARM,REGION=130K
//STEPLIB DD DSN=CNR2TW.GAN.WQI.LOADLIB,DISP=SHR
//FT02F001 DD DSN=+IPPTAPE,UNIT=SYSDA,SPACE=(CYL,(2,2),RLSE),
// DCB=(RECFM=VBS,LRECL=516,BLKSIZE=3156),DISP=(NEW,PASS,DELETE)
//FT06F001 DD SYSOUT=A
//FT20F001 DD UNIT=3330,VOL=SER=TSOOO1,DISP=(OLD,KEEP),
//  DSNAME=CNAAAA.III.(FILE NAME FROM STORET RETRIEVAL FOLLOWS)
//FT08F001 DD *
0101
/D.O.  PERCENT SAT/
+FECAL COLI  MPN/ML+
/      PH        /
+     BOD5  MG/L  +
+      NO3  MG/L  +
+      PO4  MG/L  +
/EQUIL TEMP DELTA /
/  TURBIDITY  JTU /
+ TOT SOLIDS  MG/L+

/*
//PLOT EXEC PGM=CCMP1136,COND=(8,LE),REGION=130K
//STEPLIB DD DSN=CNSSSS.ZAF.IPP.LOAD1,DISP=SHR
//FT01F001 DD DDNAME=SYSIN
//FT02F001 DD DSN=+IPPTAPE,DISP=(OLD,DELETE,DELETE)
//FT06F001 DD SYSOUT=A
//FT15F001 DD SYSOUT=A
//* USE THE NEXT THREE STATEMENTS WITH CALCOMP POSTPROCESSOR ONLY.
//FT03F001 DD DDNAME=PLOTTAPE
//PLOTTAPE DD DSN=IPPTAPE,UNIT=(2400,,DEFER),VOL=SER=TTTTTT,
// LABEL=(1,SL),DCB=DEN=2,DISP=(MOD,KEEP)
/*
```

PROGRAM B: PLOT/PRINT NSF - WQI PARAMETER DATA

SAMPLE OUTPUT

STATION 341002

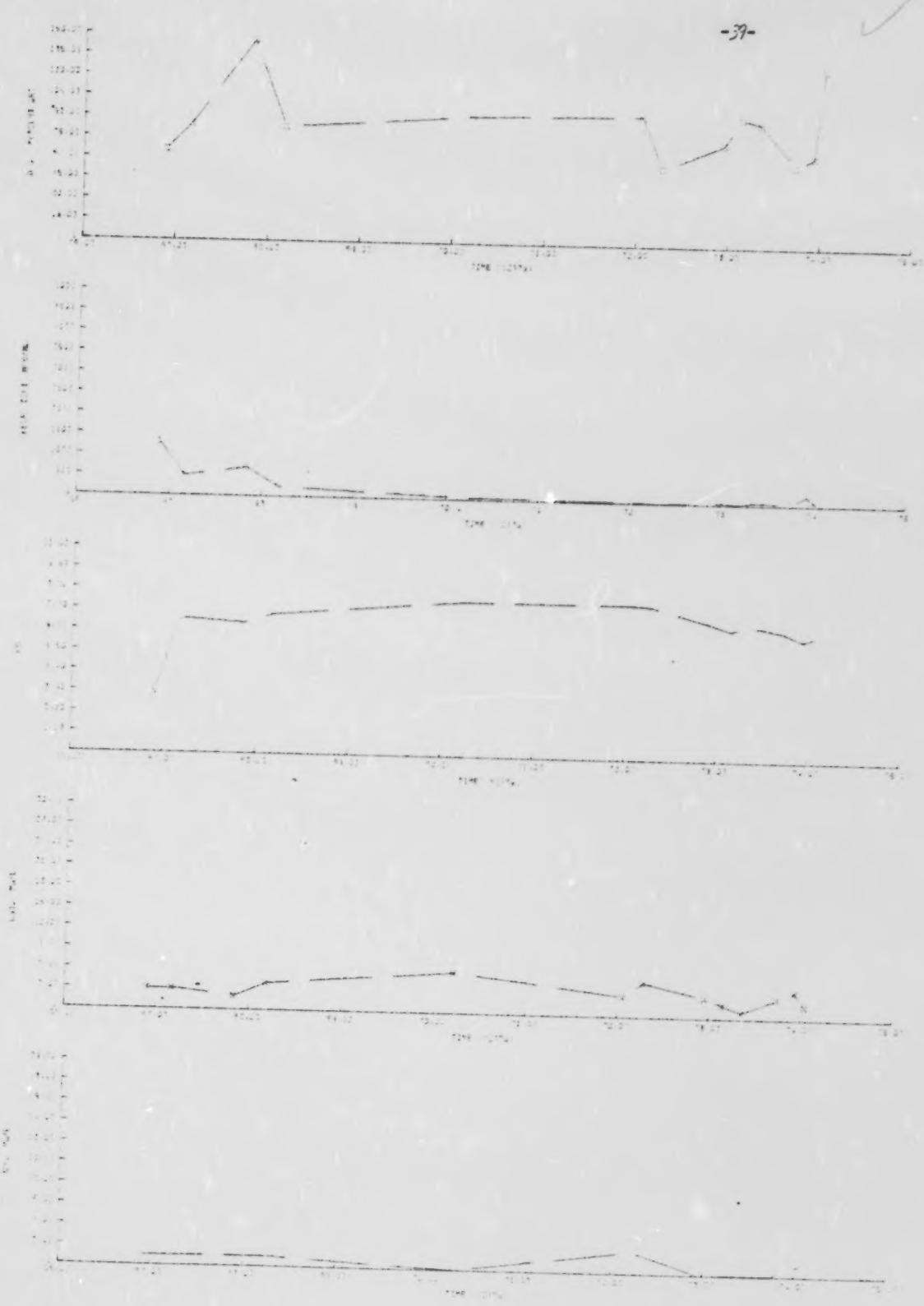
341002 2
40 19 30.0 074 01 12.0 2
SHREWSBURY RIVER (AC2)
34 NEW JERSEY
NORTHEAST
LOWER HUDSON N.Y. METROPOLITAN AREA
21NJDEP1 2111204
0000 FEET DEPTH CLASS 00

DATE	TIME	D O (SAT)	F.C. MPN	PH	BOD5	NO3	PO4	TEMP DELTA	TURB	TOT SOLIDS	CL
2/28/67		128.0376	130.0000	8.5000	7.0000	2.0000	0.5000	-2.2778	32.5000	29424.0000	0.0000
9/13/67		128.6748	24000.0000	7.8000	10.0000	0.1200	1.9000	-4.7780	24.5000	19815.0000	0.0000
11/ 1/67		65.4368	790.0000	7.3000	3.0000	1.0000	0.6000	3.2222	8.0000	24960.0000	0.0000
11/22/67		111.1842	790.0000	5.5000	10.0000	0.5800	1.8000	-2.1778	46.0000	28005.0000	0.0000
1/19/72		103.1529	5.0000	8.5000	7.0000	2.0000	0.2400	1.4444	9.0000	19140.0000	0.0000
4/10/72		79.8660	13.0000	7.3000	3.0000	6.0000	0.0600	-5.0000	17.0000	280.0000	0.0000
12/12/72		88.0047	49.0000	7.3000	1.0000	0.0	0.1600	-1.3334	0.0	684.0000	0.0000
2/20/73		89.4076	11.0000	7.2000	2.0000	1.0000	0.2000	-2.7778	6.0000	13400.0000	0.0000
5/ 7/73		82.8319	13.0000	7.4000	2.0000	0.0	0.1000	-5.0000	9.0000	17880.0000	0.0000
9/24/73		62.9810	8.0000	7.0000	2.0000	0.0	1.0000	-3.7780	4.0000	36640.0000	0.0000
12/ 5/73		81.9129	23.0000	7.2000	3.0000	0.0	0.4000	4.6666	2.0000	37290.0000	0.0000
1/14/74		79.8526	920.0000	6.9000	2.0000	1.0000	0.5000	-0.5556	7.0000	21990.0000	0.0000

STATION 341003

341003 3
40 06 15.0 074 03 13.0 2
MANASQUAN RIVER (AC3)
34 NEW JERSEY
NORTHEAST
NEW JERSEY COASTAL
21NJDEP1 2111204
0000 FEET DEPTH CLASS 00

DATE	TIME	D O (SAT)	F.C. MPN	PH	BOD5	NO3	PO4	TEMP DELTA	TURB	TOT SOLIDS	CL
11/22/66		88.4948	50.0000	6.3000	2.0000	0.6600	0.5000	-3.3778	8.3000	350.0000	0.0000
2/28/67		84.5135	110.0000	7.5000	2.0000	3.0000	2.3000	1.2222	27.0000	207.0000	0.0000
9/13/67		90.3914	3480.0000	7.8000	2.0000	0.3400	0.7000	-4.7780	19.5000	345.0000	0.0000
11/ 1/67		76.3012	1090.0000	7.3000	3.0000	1.0000	1.1000	2.2222	25.0000	336.0000	0.0000
1/19/72		69.5804	920.0000	7.2000	6.0000	2.0000	1.0000	4.4444	10.0000	4164.0000	0.0000
4/10/72		77.6906	540.0000	7.7000	2.0000	4.0000	0.5200	-5.0000	34.0000	180.0000	0.0000
12/12/72		86.0362	49.0000	7.0000	1.0000	0.0	0.4000	0.6666	17.0000	334.0000	0.0000
2/20/73		85.2749	5.0000	7.1000	3.0000	1.0000	0.5000	1.2222	18.0000	356.0000	0.0000
5/ 7/73		88.5820	540.0000	7.4000	1.0000	0.0	1.3000	-5.0000	15.0000	286.0000	0.0000
9/24/73		75.3901	920.0000	7.8000	2.0000	0.0	1.5000	-5.0000	13.0000	422.0000	0.0000
12/ 5/73		90.5750	130.0000	7.5000	4.0000	0.0	1.5000	8.6666	18.0000	176.0000	0.0000
1/14/74		81.9001	220.0000	7.1000	4.0000	1.0000	1.0000	-0.5556	20.0000	284.0000	0.0000



GAGE STATION NO. 341001 NAVELINK RIVER AT

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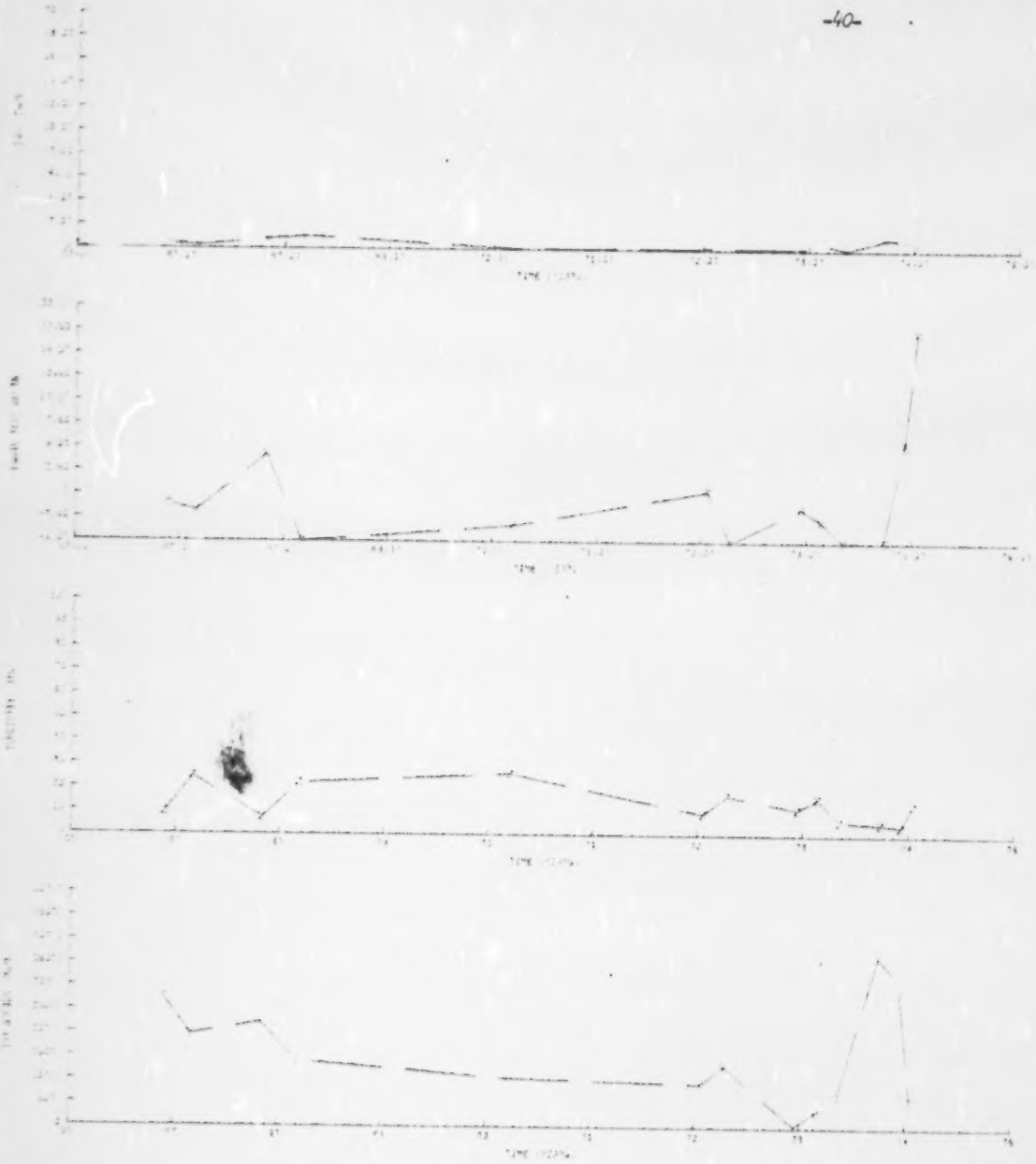
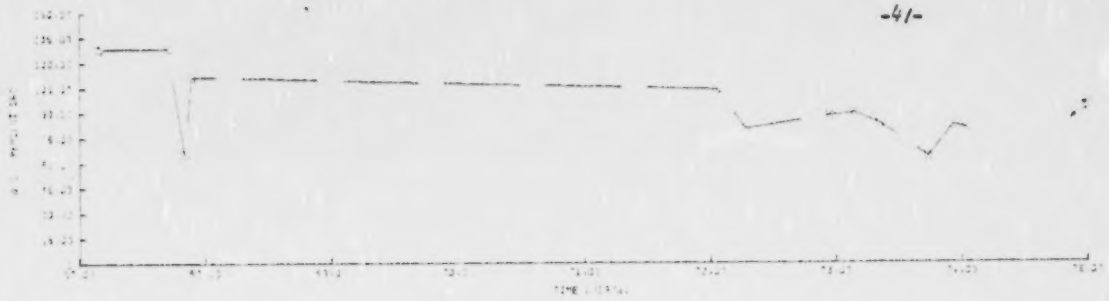
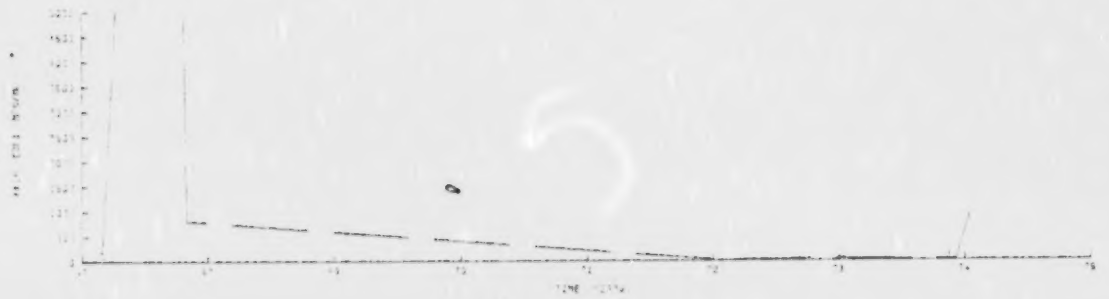
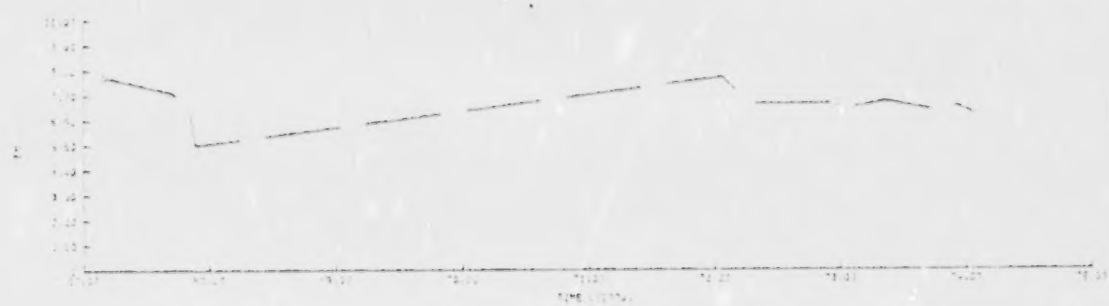
best available copy.

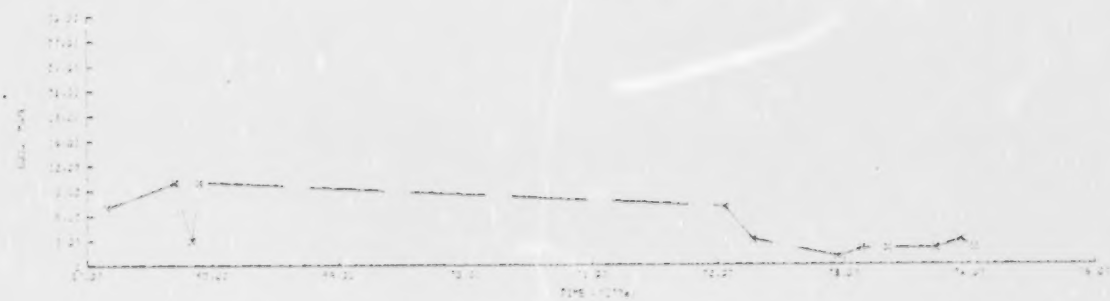


STORET STATION NO. 34100201 AMMELINK RIVER AT U.S.

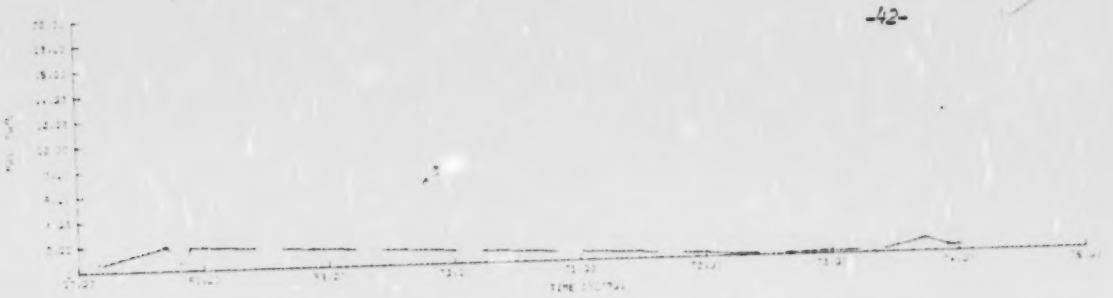


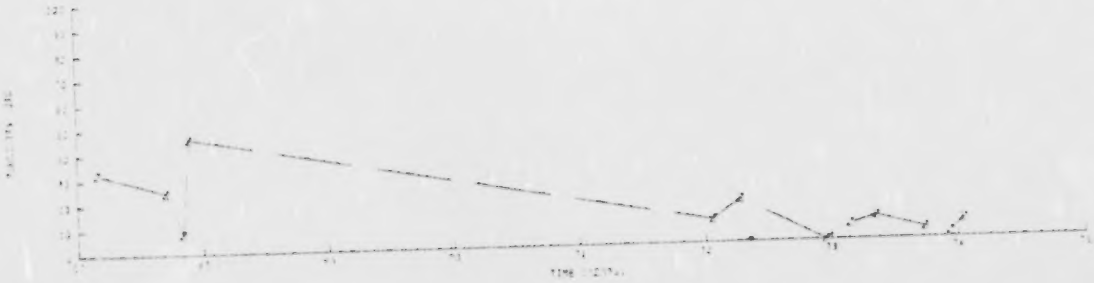


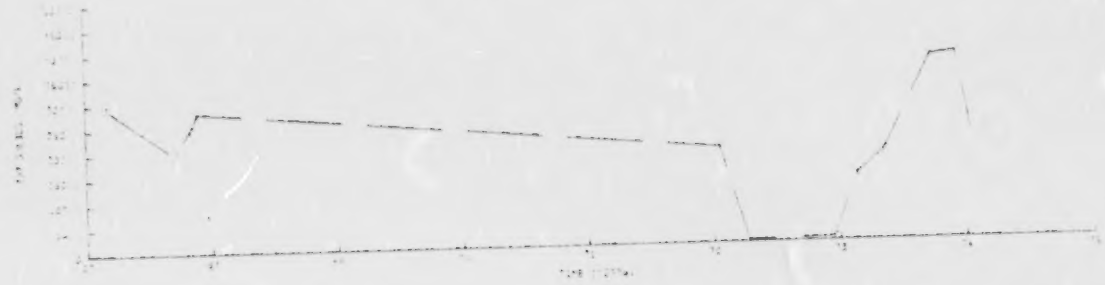




UPPER WATTEN 42 34.000 SHREWSBURY RIVER (ACC.







STREET STATION NO. 74L000 SHREWSBURY RIVER, N.J.

PROGRAM B - SOURCE LISTING

```
C     ************************************************************************PARAM000
C     ************************************************************************PARAM001
C                                                                               PARAM002
C     THIS PROGRAM PLOTS AND/OR PRINTS THE RAW DATA USED TO COMPUTE             PARAM003
C     THE WQI AT STORET STATIONS, FOR THE RETRIEVED TIME INTERVAL               PARAM004
C                                                                               PARAM005
C     *** THIS VERSION PLOTS UP TO FIVE PARAMETERS PER FRAME ***                PARAM006
C                                                                               PARAM007
C     ************************************************************************PARAM008
C     ************************************************************************PARAM009
C                                                                               PARAM010
      DIMENSION PLDATA(30),SYMBOL(14),XXVAL(100),SCL(5),YYVAL(100)              PARAM011
      DIMENSION TOP(12),HIGHY(9),PTITLE(9,5),YTITLE(5),VAL(9,100)               PARAM012
      DIMENSION AGENCY(2),DESCRP(30),EQTEMP(12),PARAM(10),SMALL(9),             PARAM013
     1STAT(4),DAYS(12)                                                          PARAM014
      DATA DAYS/31.,28.,31.,30.,31.,30.,31.,31.,30.,31.,30.,31./                PARAM015
      DATA SMALL/0.,1.,2.,0.,0.,0.,-10.,0.0,0.0/                                PARAM016
      DATA HIGHY/150., 5000.,11.,30.,20.,20.,20.,100.,50000./                   PARAM017
      DATA SKPTIM/'2500'/,SPACE/'    '/                                         PARAM018
      DATA SYMBOL/'Q','O','T','X','D','A','M','Z','Y','B','*','H','I'/         PARAM019
C     ************************************************************************PARAM020
C                                                                               PARAM021
C     THESE VALUES ARE MONTHLY EQUILIBRIUM TEMPERATURES FOR THE                 PARAM022
C     STATE OF NEW JERSEY   REF  'EFFECT OF GEOGRAPHICAL LOCATION ON            PARAM023
C     COOLING POND REQUIREMENT AND PERFORMANCE 16130 FDQ 03/71                  PARAM024
C                                                                               PARAM025
C     ************************************************************************PARAM026
      DATA EQTEMP/33.,37.,45.,57.,69.,78.,83.,81.,73.,60.,46.,38./              PARAM027
      M=8                                                                       PARAM028
C                                                                               PARAM029
      READ(M,1)IPRNT,IPLOT                                                      PARAM030
    1 FORMAT(2I2)                                                               PARAM031
C     ************************************************************************PARAM032
C                                                                               PARAM033
C     READ Y-AXIS PARAMETER LABEL TO ARRAY IF PLOTING                           PARAM034
C                                                                               PARAM035
C     ************************************************************************PARAM036
      IF(IPLOT.GT.0)READ(M,4)((PTITLE(L,JX),JX=1,5),L=1,9)                      PARAM037
    4 FORMAT(5A4)                                                               PARAM038
      KK=0                                                                      PARAM039
      XXMAX=0.0                                                                 PARAM040
      YYMAX=0.0                                                                 PARAM041
C     ************************************************************************PARAM042
C                                                                               PARAM043
C **READ DELIMITER RECORD - VERIFY BEGINNING OF DATA RECORDS**                  PARAM044
C                                                                               PARAM045
C     ************************************************************************PARAM046
   12 READ(20,111,END=400) IDUMMY                                               PARAM047
  111 FORMAT(25X,I2)                                                            PARAM048
      IF (IDUMMY.EQ.99) GOTO 22                                                 PARAM049
      GOTO 12                                                                   PARAM050
C                                                                               PARAM051
C     ************************************************************************PARAM052
C     *** COMMANDS BELOW USE THE INTEGRATED PLOTTING PACKAGE ***                PARAM053
```

PROGRAM B - SOURCE LISTING

```
C                                                                       PARAM054
C     ***************************************************************PARAM055
  232 IF(IPLOT.LE.0)GO TO 100                                           PARAM056
      HINIT=14.                                                         PARAM057
      LN=1                                                              PARAM058
C     ***************************************************************PARAM059
C                                                                       PARAM060
C     THIS NEXT CALL IS REQUIRED FOR PLOTS LARGER THAN 10.5 INCHES...   PARAM061
C                                                                       PARAM062
C     ***************************************************************PARAM063
      CALL CMLBF('PLOT IS 11X14 IN. ')                                  PARAM064
C                                                                       PARAM065
C     SET INITIAL VALUES ON SPECIFICATIONS ARRAY                        PARAM066
C                                                                       PARAM067
      CALL SSPECS(PLDATA)                                               PARAM068
      H17=PLDATA(17)/2.                                                 PARAM069
      H18=PLDATA(18)/2.                                                 PARAM070
C                                                                       PARAM071
C     ENTER NUMBER OF DATA POINTS TO PLOT                               PARAM072
C                                                                       PARAM073
      PLDATA(13)=MM-1                                                   PARAM074
C                                                                       PARAM075
C     RESET SIZE OF AXES (INCHES)  Y ONLY                               PARAM076
C                                                                       PARAM077
      PLDATA(8)=2.0                                                     PARAM078
      DO 2  L=1,9                                                       PARAM079
C                                                                       PARAM080
C     SET PLOTTING SYMBOL DESIRED                                       PARAM081
C                                                                       PARAM082
      PLDATA(16)=SYMBOL(L)                                              PARAM083
C                                                                       PARAM084
C     SET LETTER SIZE OF LABELS TO HALF DEFAULT (.05)                   PARAM085
C                                                                       PARAM086
      PLDATA(17)=H17                                                    PARAM087
      PLDATA(18)=H18                                                    PARAM088
C                                                                       PARAM089
C     MOVE X-AXIS 11.5 INCHES AWAY FROM ORIGIN - USING 2.5 INCHES FOR   PARAM090
C     EACH GRAPH FOR A TOTAL FRAME SIZE OF 10 X 14 INCHES               PARAM091
C                                                                       PARAM092
      PLDATA(2)=HINIT-(LN*2.5)                                          PARAM093
C                                                                       PARAM094
C     CLEAR WORK AREA                                                   PARAM095
C                                                                       PARAM096
      DO 15  K=1,5                                                      PARAM097
   15 SCL(K)=0.0                                                        PARAM098
C                                                                       PARAM099
C     SET RANGE OF VALUES ON X-AXIS ** NO. DIVISIONS=NO.YEARS ANALYZED  PARAM100
C                                                                       PARAM101
      KK=XXMAX+1                                                        PARAM102
      PLDATA(3)=KK                                                      PARAM103
      KK2=XXVAL(1)                                                      PARAM104
      PLDATA(4)=KK2                                                     PARAM105
      PLDATA(9)=KK-KK2                                                  PARAM106
C                                                                       PARAM107
```

PROGRAM B - SOURCE LISTING

```
C     SET RANGE OF VALUES ON Y-AXIS                                          PARAM108
C                                                                            PARAM109
      PLDATA(5)=HIGHY(L)                                                     PARAM110
C                                                                            PARAM111
C     TEST SOLIDS AMOUNT AT STATION -- RESET Y-SCALE IF NECESSARY            PARAM112
C                                                                            PARAM113
      IF(L.EQ.9.AND.VAL(9,1).LT.1000)PLDATA(5)=2000.                         PARAM114
      PLDATA(6)=0.0                                                          PARAM115
C                                                                            PARAM116
C     FOR TEMPERATURE CHANGE -- Y-SCALE MUST ACCOMODATE NEGATIVE VALUES      PARAM117
C                                                                            PARAM118
      IF(L.EQ.7)PLDATA(6)=-5.0                                               PARAM119
C                                                                            PARAM120
C     SET NO. OF DECIMALS ON Y-AXIS DEPENDING ON PARAMETER ...               PARAM121
C                                                                            PARAM122
      PLDATA(28)=2.0                                                         PARAM123
      IF(L.EQ.2.OR.L.EQ.8.OR.L.EQ.9)PLDATA(28)=0.0                           PARAM124
C                                                                            PARAM125
C     CHANGE DEFAULT VALUE OF DIVISIONS FOR Y-AXIS                           PARAM126
C                                                                            PARAM127
      PLDATA(10) = 10.                                                       PARAM128
C                                                                            PARAM129
C     CLEAR ZONES -- UPDATED BY TITLES ON PREVIOUS GRAPH                     PARAM130
C                                                                            PARAM131
      CALL ZZONES(PLDATA)                                                    PARAM132
C                                                                            PARAM133
C     DRAW  X-Y  AXES                                                        PARAM134
C                                                                            PARAM135
      CALL AXLILI(PLDATA)                                                    PARAM136
C                                                                            PARAM137
C     DRAW ANNOTATION NUMBERS AT THE BOTTOM SCALE MARKS                      PARAM138
C                                                                            PARAM139
      CALL NODLIB(PLDATA)                                                    PARAM140
C                                                                            PARAM141
C     DRAW ANNOTATION NUMBER AT THE LEFT SCALE MARKS                         PARAM142
C                                                                            PARAM143
      CALL NODLIL(PLDATA)                                                    PARAM144
C                                                                            PARAM145
C     CLEAR ZONES VARIABLES --  SINCE UPDATED BY ABOVE SUBROUTINE            PARAM146
C                                                                            PARAM147
      CALL ZZONES(PLDATA)                                                    PARAM148
C                                                                            PARAM149
C     PLOT SYMBOL AT DATA POINT LOCATIONS                                    PARAM150
C                                                                            PARAM151
      KK=MM-1                                                                PARAM152
      DO 6  K=1,KK                                                           PARAM153
      YYVAL(K)=VAL(L,K)                                                      PARAM154
    6 CONTINUE                                                               PARAM155
      CALL PSLILI(XXVAL,YYVAL,PLDATA)                                        PARAM156
C                                                                            PARAM157
C     NOW CONNECT DATA POINTS WITH DASHED LINE                               PARAM158
C                                                                            PARAM159
      CALL DLLILI(XXVAL,YYVAL,PLDATA)                                        PARAM160
C                                                                            PARAM161
```

PROGRAM B - SOURCE LISTING

```
C     CHANGE DEFAULT SPACING OF TITLES TO THE AXES                      PARAM162
C                                                                       PARAM163
      PLDATA(24)=.15                                                    PARAM164
      PLDATA(26)=.45                                                    PARAM165
C     ******************************************************************PARAM166
C                                                                       PARAM167
C     NOW LABEL THE AXES ......                                         PARAM168
C                                                                       PARAM169
C     ******************************************************************PARAM170
      CALL TITLEB('+  TIME (YEARS)+',PLDATA)                            PARAM171
C                                                                       PARAM172
C     MOVE APPROPIATE Y-AXES LABEL TO VECTOR FOR PLOTTING               PARAM173
C                                                                       PARAM174
      DO 8 JX=1,5                                                       PARAM175
      YTITLE(JX)=PTITLE(L,JX)                                           PARAM176
    8 CONTINUE                                                          PARAM177
      CALL TITLEL(YTITLE,PLDATA)                                        PARAM178
      IF(L.NE.5)GO TO 24                                                PARAM179
C                                                                       PARAM180
C     RESTORE TEXT LETTER SIZE FOR STATION DESCRIPTION LABEL            PARAM181
C                                                                       PARAM182
      PLDATA(17)=H17*2.                                                 PARAM183
      PLDATA(18)=H18*2.0                                                PARAM184
C                                                                       PARAM185
C     PRINT GRAPH DESCRIPTION AT LOWER, RIGHT HAND SIDE OF GRAPH        PARAM186
C                                                                       PARAM187
      PLDATA(22)=3.0                                                    PARAM188
      PLDATA(23)=.50                                                    PARAM189
      CALL GTITLE('+STORET STATION NO.+',PLDATA)                        PARAM190
      PLDATA(22)=4.9                                                    PARAM191
      CALL GTITLE(TOP,PLDATA)                                           PARAM192
C     ******************************************************************PARAM193
C                                                                       PARAM194
C     ADVANCE GRAPH PAPER FOR NEXT FOUR PARAMETERS ...                  PARAM195
C                                                                       PARAM196
C     ******************************************************************PARAM197
      CALL NXTFRM(PLDATA)                                               PARAM198
      LN = 0                                                            PARAM199
   24 LN=LN + 1                                                         PARAM200
    2 CONTINUE                                                          PARAM201
C                                                                       PARAM202
C     RESTORE TEXT LETTER SIZE FOR STATION DESCRIPTION LABEL            PARAM203
C                                                                       PARAM204
      PLDATA(17)=H17*2.                                                 PARAM205
      PLDATA(18)=H18*2.0                                                PARAM206
C                                                                       PARAM207
C     PRINT GRAPH DESCRIPTION AT LOWER, RIGHT HAND SIDE OF GRAPH        PARAM208
C                                                                       PARAM209
      PLDATA(22)=3.0                                                    PARAM210
      PLDATA(23)=.50                                                    PARAM211
      CALL GTITLE('+STORET STATION NO.+',PLDATA)                        PARAM212
      PLDATA(22)=4.9                                                    PARAM213
      CALL GTITLE(TOP,PLDATA)                                           PARAM214
C                                                                       PARAM215
```

PROGRAM 8 - SOURCE LISTING

```
C       ADVANCE GRAPH PAPER FOR NEXT STATION                                    PARAM216
C                                                                               PARAM217
        CALL NXTFRM(PLDATA)                                                     PARAM218
  432   STAT(1)=SPACE                                                          PARAM219
   22   READ(20,30,END=330) AGENCY,STAT,DESCRP                                  PARAM220
 30     FORMAT(2A4,4A4,1X,30A4)                                                 PARAM221
        MM=1                                                                    PARAM222
        IF(IPRNT.GT.0) WRITE(6,40) STAT,DESCRP                                  PARAM223
 40     FORMAT('1STATION ',4A4,/,' ',30A4)                                      PARAM224
        DO 60 I=1,8                                                             PARAM225
        READ(20,30,END=310) AGENCY,STAT,DESCRP                                  PARAM226
        IF(IPRNT.GT.0) WRITE(6,50) DESCRP                                       PARAM227
 50     FORMAT(' ',30A4)                                                        PARAM228
        IF(I.EQ.2.AND.IPLOT.GT.0)GO TO 61                                       PARAM229
        GO TO 60                                                                PARAM230
   61   TOP(1)=SYMBOL(4)                                                        PARAM231
        TOP(2)=STAT(1)                                                          PARAM232
        TOP(3)=STAT(2)                                                          PARAM233
        TOP(4)=SPACE                                                            PARAM234
        TOP(5)=DESCRP(17)                                                       PARAM235
        TOP(6)=DESCRP(18)                                                       PARAM236
        TOP(7)=DESCRP(19)                                                       PARAM237
        TOP(8)=DESCRP(20)                                                       PARAM238
        TOP(9)=DESCRP(21)                                                       PARAM239
        TOP(10)=DESCRP(22)                                                      PARAM240
        TOP(11)=DESCRP(23)                                                      PARAM241
        TOP(12)=SYMBOL(4)                                                       PARAM242
 60     CONTINUE                                                                PARAM243
C       PRINT HEADINGS IF PRINTING RAW DATA ...                                 PARAM244
        IF(IPRNT.GT.0)WRITE(6,5)                                                PARAM245
     5  FORMAT(     5X,'  DATE  ',2X,'TIME',3X,'D O (SAT)',3X,'F.C. MPN',       PARAM246
       16X,'PH',9X,'BOD5',7X,'NO3',8X,'PO4',6X,'TEMP DELTA',3X,'TURB',          PARAM247
       23X,'TOT SOLIDS',5X,'CL')                                                PARAM248
C       ************************************************************************PARAM249
C                                                                               PARAM250
C       READ STATION PARAMETRIC DATA                                            PARAM251
C                                                                               PARAM252
C       ************************************************************************PARAM253
  100   READ(20,110,END=310) AGENCY,STAT,IYR,IMON,IDAY,TIME,PARAM               PARAM254
  110   FORMAT(2A4,3A4,A3,2X,3I2,A4,10A4)                                       PARAM255
        IF (IYR.EQ.99) GOTO 232                                                 PARAM256
        DO 120 I=1,9                                                            PARAM257
C       ************************************************************************PARAM258
C                                                                               PARAM259
C       TEST FOR DUMMY VALUE IF NO SAMPLE WAS TAKEN                             PARAM260
C                                                                               PARAM261
C       ************************************************************************PARAM262
        IF ((PARAM(I).LT.1E-15).AND.(PARAM(I).GT.0.)) GOTO 100                  PARAM263
        IF (PARAM(I).GE.0.) GOTO 120                                            PARAM264
        WRITE(6,115) I,PARAM(I)                                                 PARAM265
 115    FORMAT(' ***WARNING - PARAMETER ',I1,' IS NEGATIVE, ',F3.1              PARAM266
      1,' IS SUBSTITUTED***')                                                   PARAM267
  120   CONTINUE                                                                PARAM268
        IF (TIME.EQ.SKPTIM) TIME=SPACE                                          PARAM269
```

PROGRAM B - SOURCE LISTING

```
C     ************************************************************************PARAM270
C                                                                               PARAM271
C     TEST PARAMETERS FOR MINIMUM POSSIBLE VALUES  -- IF LESS ADJUST            PARAM272
C                                                                               PARAM273
C     ************************************************************************PARAM274
      DO 156 I=1,9                                                              PARAM275
      IF (PARAM(I).LT.SMALL(I)) PARAM(I)=SMALL(I)                               PARAM276
156   CONTINUE                                                                  PARAM277
C     ************************************************************************PARAM278
C                                                                               PARAM279
C     COMPUTE SATURATION LEVEL OF OXYGEN AT STATION  --USING TEMPERATUREPARAM280
C     AND CHLORIDE CONCENTRATION                                                PARAM281
C                                                                               PARAM282
C     ************************************************************************PARAM283
      DOSAT=(1.-.000009*PARAM(10))*(14.652-.41022*PARAM(7)                      PARAM284
     1+.007991*PARAM(7)**2 -.000077774*PARAM(7)**3)                             PARAM285
C     ************************************************************************PARAM286
C                                                                               PARAM287
C     COMPUTE OXYGEN CONCENTRATION AS PERCENT SATURATION                        PARAM288
C                                                                               PARAM289
C     ************************************************************************PARAM290
       PARAM(1)=PARAM(1)/DOSAT*100.                                             PARAM291
C     ************************************************************************PARAM292
C                                                                               PARAM293
C     COMPUTE DEVIATION FROM EQUILIBRIUM TEMPERATURE                            PARAM294
C                                                                               PARAM295
C     ************************************************************************PARAM296
      PARAM(7)=(EQTEMP(IMON)-32.)*.55556 - PARAM(7)                             PARAM297
C     ************************************************************************PARAM298
C                                                                               PARAM299
C     TEST OPTION TO PRINT RAW DATA ...                                         PARAM300
C                                                                               PARAM301
C     ************************************************************************PARAM302
      IF(IPRNT.GT.0)WRITE(6,3)IMON,IDAY,IYR,TIME,(PARAM(I),I=1,10)              PARAM303
    3 FORMAT(5X,I2,'/',I2,'/',I2,3X,A4,10F11.4)                                 PARAM304
C     ************************************************************************PARAM305
C                                                                               PARAM306
C     DIGITIZE SAMPLE DATE TO FRACTION OF YEAR                                  PARAM307
C                                                                               PARAM308
C     ************************************************************************PARAM309
  278 SUM=0.                                                                    PARAM310
      IF (IMON.EQ.1) GOTO 675                                                   PARAM311
      INDEX=IMON-1                                                              PARAM312
      DO 670 I=1,INDEX                                                          PARAM313
      SUM=SUM+DAYS(I)                                                           PARAM314
670   CONTINUE                                                                  PARAM315
675   CONTINUE                                                                  PARAM316
      SUM=SUM+IDAY                                                              PARAM317
      IF ((MOD(IYR,4).EQ.0).AND.(IMON.GT.2)) SUM=SUM+1                          PARAM318
      TOTDAY=365                                                                PARAM319
      IF (MOD(IYR,4).EQ.0) TOTDAY=366                                           PARAM320
      FRAC=SUM/TOTDAY                                                           PARAM321
  191 XXVAL(MM)=IYR+FRAC                                                        PARAM322
      DO 9  JX=1,9                                                              PARAM323
```

PROGRAM 8 - SOURCE LISTING

```
      VAL(JX,MM)=PARAM(JX)                                                PARAM324
    9 CONTINUE                                                            PARAM325
C     SAVE HIGHEST OF YEARS FOR SCALING PLOT                              PARAM326
      IF(XXVAL(MM).GT.XXMAX)XXMAX=XXVAL(MM)                               PARAM327
      MM=MM+1                                                             PARAM328
  192 GO TO 100                                                           PARAM329
310   CONTINUE                                                            PARAM330
      WRITE(6,320) STAT                                                   PARAM331
320   FORMAT(//,' ABNORMAL FILE END WHILE READING STATION ',4A4)          PARAM332
      STOP                                                                PARAM333
400   WRITE(6,112)                                                        PARAM334
  112 FORMAT(10X,'BEGINNING OF DATA RECORDS NOT CONFIRMED')               PARAM335
C     ***************************************************************** PARAM336
C                                                                         PARAM337
C     IF NOT PLOTTING SET HI COND CODE TO  BYPASS PLOT POST-PROCESSOR     PARAM338
C                                                                         PARAM339
C     ***************************************************************** PARAM340
  330 IF(IPLOT.LE.0)STOP 40                                               PARAM341
C     ***************************************************************** PARAM342
C                                                                         PARAM343
C     PLOTTING IS FINISH  -- NOW CLOSE THE NEUTRAL TEXT                   PARAM344
C                                                                         PARAM345
C     ***************************************************************** PARAM346
      CALL PPPEND(PLDATA)                                                 PARAM347
  333 STOP                                                                PARAM348
      END                                                                 PARAM349
/*                                                                        PARAM350
```

PROGRAM C: SEASONAL NSF - WQI PLOTS FOR MULTIPLE STORET STATIONS

This program will plot water quality indices selectively by specified time periods. The user can specify up to fifty time periods in creating one curve and a maximum of five curves can be plotted on a frame for up to one hundred STORET stations. The graph can be sealed in the x-direction by station number sequence or by station mile point.

The water quality data input to this program is a mass storage file called "WQI Time File" and created by program A. (See system flowchart on figure 1)

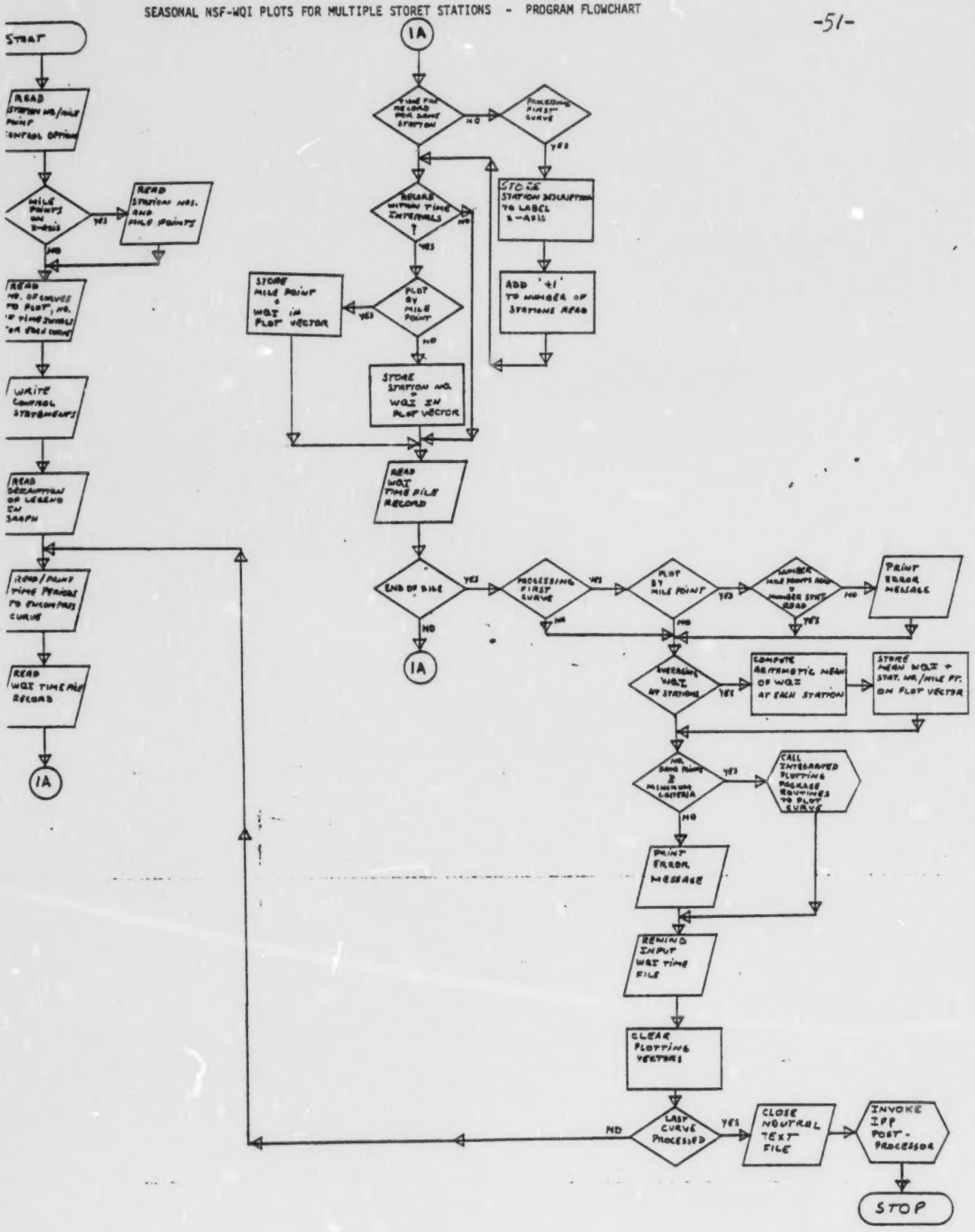
The program first reads control variables, such as the total number of curves to be plotted and the number of dates to be read for each curve, then using these the WQI Time File is read and compared to the specified time periods, those records within these periods are saved in a plotting vector with their corresponding station number or mile point.

Once all records in the WQI Time File are read the program calls Integrated Plotting Routines to draw these points in the graph and to enter the plotting symbol in the graph legend. During the first curve processing the axes are drawn and labelled, including the station name which is printed in the x-axis with the text rotated -90°.

For each of the remaining curves, the WQI Time File is re-read and the appropriate records selected. At the end of file the plotting routines are called to draw the symbol and the curve, and to enter the symbol in the graph legend. The text written in this legend is read in the program by data cards, another input by means of data cards is the station mile points (if this option is chosen).

The user can also specify a minimum number of data points, such that this criteria must be met before plotting takes place. Another option is the plotting of the arithmetic mean of a number of points in a station, for a particular curve rather than the actual data; this option generally yields a smoother curve and is used in the data presented.

SEASONAL NSF-WQI PLOTS FOR MULTIPLE STORET STATIONS - PROGRAM FLOWCHART



PROGRAM C - SEASONAL NSF-WQI MULTI-STATION PLOTS

PROGRAM INPUT

1) STATION CONTROL OPTION

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 2	ICNTL	I2	ICNTL = 0, for plots by station sequence ICNTL > 0, for plotting by station mile points
3 - 4	IAVER	I2	IAVER > 0, to average the WQI values at each station for a particular curve IAVER = 0, actual data will be plotted

2) STORET RETRIEVAL MILE POINTS (ICNTL > 0)

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 4	STNO (1)	I4	sequence number for first station (usually 0001)
11 - 20	X (1)	F10.0	mile point location of first station
21 - 24	STNO (2)	I4	sequence number for second station
31 - 40	X (2)	F10.0	mile point location of 2nd station
.	.	.	.
.	.	.	.
.	.	.	.
61 - 64	STNO (4)	I4	sequence number for 4th station
71 - 80	X (4)	F10.0	mile point location of 4th station

NOTE: The sequence number above refers to the actual sequential order of the stations in the graph. This number is used as an index to store the mile points read and to match the data to a similar sequence number in the input mass - storage WQI time file. These sequence numbers do not have to follow any particular order.

The above card is repeated as necessary until all mile points have been read in. A blank field will terminate this type of input.

3) TIME INTERVALS FOR GRAPHICAL DISPLAY

CARD COLUMNS	VARIABLE	FORMAT	DESCRIPTION
1 - 2	NTOTAL	I2	total number of curves to be plotted
4 - 5	MINPTS	I2	minimum number of data points desired by user, (if criteria is not met, plotting for particular curve will not occur)
6 - 10	INVAL (1)	I5	number of date cards to be read for plot of first curve

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
11 - 15	INVAL (2)	I5	number of date cards to be read for second curve
.	.	.	.
.	.	.	.
.	.	.	.
26 - 30	INVAL (5)	I5	number of date cards to be read for 5th curve

NOTE: A maximum of five curves can be plotted, any one curve can specify a maximum of fifty time intervals (dates)

4) DESCRIPTION FOR GRAPH LEGEND

The text entered here will be written next to the symbol being plotted under the graph legend.

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1-48	LEGEND (1,1-12)	12A4	text describing the first curve

The card above is repeated if necessary to enter the description of 'NTOTAL' number of curves.

5) DATE CARDS FOR EACH CURVE

CARD COLUMN	VARIABLE	FORMAT	DESCRIPTION
1 - 6	IBEGIN (1,1-3)	3I2	beginning date (as MONTH-DAY-YEAR) of time period
11 - 16	IEND (1,1-3)	3I2	ending date (as MMDDYY) of time period

In order for the logic of the program to work properly, the change of the year within a season would be written on two separate statements, so that the ending date is a higher numerical value than the beginning date. eg: WINTER 1975 would be entered as:

```
12345678901234567890
111575    123175, followed by:
010176    023076
```

The card above is repeated if necessary for the other time intervals, until the number of intervals specified on variable INVAL (1) for the first curve have been met, followed by the date cards for the second curve specified on variable INVAL (2) ... and repeated for the number of curves desired.

6) NSF-WQI TIME FILE (CREATED IN PROGRAM 1)

RECORD POSITIONS	VARIABLE	FORMAT	DESCRIPTION
1 - 6	IDATE	I6	sample date
7 - 8	IOPTN	I2	IOPTN = 0, CUMM WQI IOPTN > 1, MULT WQI
9 - 24	STAT (1-4)	4A4	STORET primary station number
25 - 27	ISEQ	I3	station sequence number, used to label plots by station number or for matching mile points entered previously
28 - 39	XXVAL	F12.4	date + year digitized - this value is presently not used by this program
40 - 51	WQI	F12.4	NSF-WQI for given date
52 - 99	TOP (1-12)	12A4	station description

SAMPLE DECK SET-UP FOR PROGRAM EXECUTION FROM SOURCE STATEMENTS:

```
//IIIWQI JOB (AAAA,III,1,5)
//  EXEC IPP1136G,REGION=130K,TAPE=TTTTTT,DISP=NEW
//*  THIS PROCEDURE WILL INVOKE THE CALCOMP POST PROCESSOR
        .                              .                              .
        .                              .                              .
        .                              .                              .
        .                              .                              .
                S O U R C E   P R O G R A M   G O E S   H E R E
        .                              .                              .
        .                              .                              .
        .                              .                              .
        .                              .                              .
//GO.FT25F001 DD UNIT=3330,VOL=SER=TSO001,DISP=(OLD,KEEP),
// DCB=(RECFM=FB,LRECL=99,BLKSIZE=12969),SPACE=(TRK,(5,1),RLSE),
//  DSNAME=CNAAAA.III.(TIME FILE NAME GOES HERE)
//GO.FT08F001  DD *
0101
0001       2.4       0002       13.5      0003       20.9      0004       24.9
0005       27.3      0006       32.6      0007       38.6      0008       42.4
0009       55.4      0010       58.3      0011       64.2      0012       71.1
0013       77.3      0014       80.7
03 01    2    3    3
* = SUMMER 1968 AND 1969*
* = SUMMER  1970-1972*
* = SUMMER FROM 1973 - PRESENT*
060168    093068
060169    093069
060170    093170
060171    093171
060172    093172
060173    093173
060174    093174
060175.   093175
/*
//PLOT.SYSIN DD DUMMY
/*
```

SAMPLE DECK SET-UP FOR PROGRAM EXECUTION FROM LOAD MODULE:

```
//IIIWQI JOB (AAAA,III,1,5)
//SO EXEC RINGIN,VOLS=TTTTTT
/*
//S1 EXEC PGM=SEASONAL,REGION=130K
//STEPLIB DD DSN=CNR2TW.GAN.WQI.LOADLIB,DISP=SHR
//FT02F001 DD DSN=&IPPTAPE,UNIT=SYSDA,SPACE=(CYL,(2,2),RLSE),
// DCB=(RECFM=VBS,LRECL=516,BLKSIZE=3156),DISP=(NEW,PASS,DELETE)
//FT06F001 DD SYSOUT=A
//FT25F001 DD UNIT=3330,VOL=SER=TSO001,DISP=(OLD,KEEP),
// DCB=(RECFM=FB,LRECL=99,BLKSIZE=12969),SPACE=(TRK,(5,1),RLSE),
//  DSNAME=CNAAAA.III.(TIME FILE NAME GOES HERE)
//FT08F001 DD *
0101
0001        2.4       0002        13.5      0003        20.9      0004        24.9
0005        27.3      0006        32.6      0007        38.6      0008        42.4
0009        55.4      0010        58.3      0011        64.2      0012        71.1
0013        77.3      0014        80.7
03 01    2     3     3
* = SUMMER 1968 AND 1969*
* = SUMMER  1970-1972*
* = SUMMER FROM 1973 - PRESENT*
060168    093068
060169    093069
060170    093170
060171    093171
060172    093172
060173    093173
060174    093174
060175    093175

/*
//PLOT EXEC PGM=CCMP1136,COND=(8,LE),REGION=130K
//STEPLIB DD DSN=CNSSSS.ZAF.IPP.LOAD1,DISP=SHR
//FT03F001 DD DDNAME=PLOTTAPE
//PLOTTAPE DD DSN=IPPTAPE,UNIT=(2400,,DEFER),VOL=SER=TTTTTT,
// LABEL=(1,SL),DCB=DEN=2,DISP=(NEW,KEEP)
/*
/*
```

PROGRAM C: SEASONAL NSF - WQI PLOTS FOR MULTIPLE STORET STATIONS

SAMPLE OUTPUT

INPUT CONTROL PARAMETERS

TOTAL NO. OF INTERVAL SETS = 3

*** CURVE NO. 1 ***

NO. OF TIME INTERVALS FOR THIS SET= 2

FROM	TO
6/ 1/68	9/30/68
6/ 1/69	9/30/69

PLOTTING FOR CURVE NO. 1 -- PROCESSED SUCCESSFULLY WITH 21 POINTS

*** CURVE NO. 2 ***

NO. OF TIME INTERVALS FOR THIS SET= 3

FROM	TO
6/ 1/70	9/31/70
6/ 1/71	9/31/71
6/ 1/72	9/31/72

PLOTTING FOR CURVE NO. 2 -- PROCESSED SUCCESSFULLY WITH 35 POINTS

*** CURVE NO. 3 ***

NO. OF TIME INTERVALS FOR THIS SET= 3

FROM	TO
6/ 1/73	9/31/73
6/ 1/74	9/31/74
6/ 1/75	9/31/75

PLOTTING FOR CURVE NO. 3 -- PROCESSED SUCCESSFULLY WITH 18 POINTS

```
C A L C O M P  P O S T P R O C E S S O R  OF IPP    - COMMENTS AND ERROR MESSAGES -    VERSION 01 MAY 74

FRAME NUMBER     1 STARTING WITH RECORD NUMBER      1
FRAME NUMBER     1 PROCESSED WITH     0 ERRORS DETECTED

SUMMARY
          RECORDS      64
          FRAMES        1
          ERRORS        0

END OF POSTPROCESSOR RUN FOR IPP
```

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INPUT CONTROL PARAMETERS

TOTAL NO. OF INTERVAL SETS = 3

*** CURVE NO. 1 ***

NO. OF TIME INTERVALS FOR THIS SET= 8

FROM	TO
11/ 1/66	12/31/66
1/ 1/67	2/30/67
11/ 1/67	12/31/67
1/ 1/68	2/30/68
11/ 1/68	12/31/68
1/ 1/69	2/30/69
11/ 1/69	12/31/69
1/ 1/70	2/30/70

PLOTTING FOR CURVE NO. 1 -- PROCESSED SUCCESSFULLY WITH 34 POINTS

*** CURVE NO. 2 ***

NO. OF TIME INTERVALS FOR THIS SET= 6

FROM	TO
11/ 1/70	12/31/70
1/ 1/71	2/30/71
11/ 1/71	12/31/71
1/ 1/72	2/30/72
11/ 1/72	12/31/72
1/ 1/73	2/30/73

PLOTTING FOR CURVE NO. 2 -- PROCESSED SUCCESSFULLY WITH 36 POINTS

*** CURVE NO. 3 ***

NO. OF TIME INTERVALS FOR THIS SET= 6

FROM	TO
11/ 1/73	12/31/73
1/ 1/74	2/30/74
11/ 1/74	12/31/74
1/ 1/75	2/30/75
11/ 1/75	12/31/75
1/ 1/76	2/30/76

PLOTTING FOR CURVE NO. 3 -- PROCESSED SUCCESSFULLY WITH 17 POINTS

```
C A L C O M P  P O S T P R O C E S S O R  OF IPP    - COMMENTS AND ERROR MESSAGES -    VERSION 01 MAY 74

FRAME NUMBER     1 STARTING WITH RECORD NUMBER       1
FRAME NUMBER     1 PROCESSED WITH     0 ERRORS DETECTED

SUMMARY
          RECORDS     67
          FRAMES       1
          ERRORS       0

END OF POSTPROCESSOR RUN FOR IPP
```

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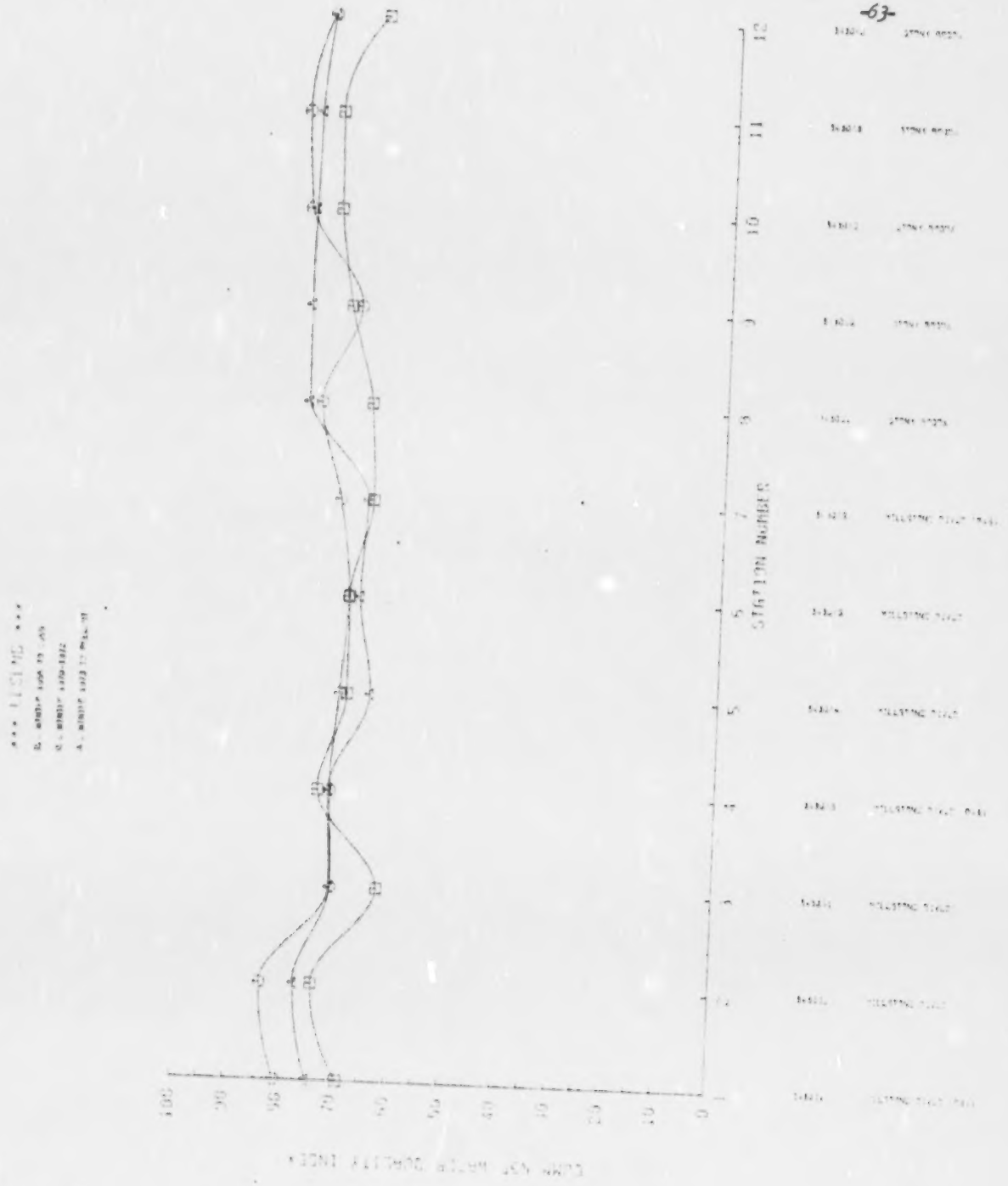

PROGRAM C - SOURCE LISTING

```
C     ********************************************************************** SWQI004
C     ********************************************************************** SWQI005
C                                                                            SWQI006
C     ** THIS PROGRAM WILL SELECT STATIONS ACCORDING TO TIME PERIODS AND     SWQI007
C     PLOT THE NSF-WQI OR THE RAW DATA USING OSI IPP PLOTTING PACKAGE **      SWQI008
C                                                                            SWQI009
C     ** USER MAY SPECIFY UP TO 5 TIME INTERVALS --                          SWQI010
C        FOR UP TO 100 STORET STATIONS **                                    SWQI011
C                                                                            SWQI012
C     THE GRAPHS CAN BE BY MILE POINT OR BY STATION NUMBERS                  SWQI013
C                                                                            SWQI014
C     FILE INPUT IS CREATED BY THE STATION WQI PLOT PROGRAM ..               SWQI015
C     (TIME PLOT) --  THIS FILE IS BY STATION/DATE SEQUENCE                  SWQI016
C     ********************************************************************** SWQI017
C                                                                            SWQI018
C     ********************************************************************** SWQI019
C     ********************************************************************** SWQI020
C                                                                            SWQI021
      INTEGER STATNO(100),INVAL(5),SNAMES(100,12),TOP(12),STNO(4)            SWQI022
      DIMENSION X(4),DIST(100),IBEGIN(50,4),IEND(50,4),GIVEN(5),             SWQI023
     1SYMBOL(14),STAT(4),YPOINT(800),XPOINT(800),PLDATA(30),LEGEND(5,12)     SWQI024
      DIMENSION BUFX(500),BUFY(500),XAVER(100),YAVER(100)                    SWQI025
      DATA SYMBOL/'Q','O','T','+','X','D','A','M','Z','Y','B','*','H','I    SWQI026
     1'/                                                                     SWQI027
      IL=1                                                                   SWQI028
      M=8                                                                    SWQI029
C     ********************************************************************** SWQI030
C                                                                            SWQI031
C     READ STATION CONTROL OPTION  --  MILE POINT OR STATION ID SEQUENCE     SWQI032
C                                                                            SWQI033
C     READ ALSO OPTION TO AVERAGE VALUES AT A STATION FOR A PARTICULAR       SWQI034
C     CURVE (IAVER .GT. 1 )  ....                                            SWQI035
C                                                                            SWQI036
C     NOTE  --  ICNTL = 0  FOR PLOTS BY SEQUENCE OF STATION                  SWQI037
C               ICNTL = 1 FOR PLOTTING STATION MILE POINTS                   SWQI038
C                                                                            SWQI039
C     ********************************************************************** SWQI040
      READ(M,21)ICNTL,IAVER                                                  SWQI041
   21 FORMAT(2I2)                                                            SWQI042
      IF(ICNTL.LE.0)GO TO 5                                                  SWQI043
    4 READ(M,20)(STNO(K),X(K) , K=1,4)                                       SWQI044
   20 FORMAT(4(I4,6X,F10.0))                                                 SWQI045
      DO 3 J=1,4                                                             SWQI046
C     ********************************************************************** SWQI047
C                                                                            SWQI048
C     NOTE ... BLANK FIELD WILL INTERRUPT INPUT  ...                         SWQI049
C                                                                            SWQI050
C     ********************************************************************** SWQI051
      IF(STNO(J).EQ.0)GO TO 5                                                SWQI052
      STATNO(IL)=STNO(J)                                                     SWQI053
C     ********************************************************************** SWQI054
C                                                                            SWQI055
C     MILE POINT IS SAVED USING STAT. NO. AS INDEX ...                       SWQI056
C                                                                            SWQI057
```

PROGRAM C - SOURCE LISTING

```
C     ********************************************************************** SWQI058
      ILOC =STNO(J)                                                          SWQI059
      DIST(ILOC)=X(J)                                                        SWQI060
      IL=IL+1                                                                SWQI061
    3 CONTINUE                                                               SWQI062
      GO TO 4                                                                SWQI063
C     ********************************************************************** SWQI064
C                                                                            SWQI065
C     VARIABLE IL WILL CONTAIN ACTUAL NO. OF MILE PTS.FOR STATIONS READ      SWQI066
C                                                                            SWQI067
C     ********************************************************************** SWQI068
    5 IL=IL-1                                                                SWQI069
C     ********************************************************************** SWQI070
C                                                                            SWQI071
C     READ TIME INTERVALS (MMDDYY) DESIRED FOR PLOTTING  ...                 SWQI072
C                                                                            SWQI073
C     ********************************************************************** SWQI074
      READ(M,26)NTOTAL,MINPTS,(INVAL(J),J=1,5)                               SWQI075
   26 FORMAT(I2,1X,I2,5I5)                                                   SWQI076
C     ********************************************************************** SWQI077
C                                                                            SWQI078
C              TO PRODUCE ONE CURVE ...                                      SWQI079
C     NOTE ... INVAL(I)= NO. OF DATES TO BE READ AT EACH INTERVAL            SWQI080
C              NTOTAL= TOTAL NUMBER OF CURVES TO BE PLOTTED                  SWQI081
C                                                                            SWQI082
C     ********************************************************************** SWQI083
      WRITE(6,23)NTOTAL                                                      SWQI084
   23 FORMAT('1',///,50X,'INPUT CONTROL PARAMETERS',/,5X,                    SWQI085
     1'TOTAL NO. OF INTERVAL SETS =' ,I3,/)                                  SWQI086
C     ********************************************************************** SWQI087
C                                                                            SWQI088
C     PRINT STATION NUMBERS AND MILE POINTS ...                              SWQI089
C                                                                            SWQI090
C     ********************************************************************** SWQI091
      IF(ICNTL.LE.0) GO TO 11                                                SWQI092
      WRITE(6,8)                                                             SWQI093
    8 FORMAT(//,5X,'STATION NUMBER',5X,'MILE POINT')                         SWQI094
      WRITE(6,16)(STATNO(J),DIST(J),J=1,IL)                                  SWQI095
   16 FORMAT(9X,I6,10X,F6.1)                                                 SWQI096
C     ********************************************************************** SWQI097
C                                                                            SWQI098
C     READ TEXT FOR LEGEND IN CHARACTER BALANCED NOTATION ...                SWQI099
C                                                                            SWQI100
C     ********************************************************************** SWQI101
   11 READ(M,2)((LEGEND(J,K),K=1,12),J=1,NTOTAL)                             SWQI102
    2 FORMAT(12A4)                                                           SWQI103
      DO 99  KL=1,NTOTAL                                                     SWQI104
      INDEX=1                                                                SWQI105
      ICNT=0                                                                 SWQI106
      IOLD=0                                                                 SWQI107
      LAST=INVAL(KL)                                                         SWQI108
      DO 6  J=1,LAST                                                         SWQI109
      READ(M,22)((IBEGIN(J,K),K=1,3),(IEND(J,K),K=1,3))                      SWQI110
   22 FORMAT(3I2,4X,3I2)                                                     SWQI111
```

PROGRAM C - SOURCE LISTING

```
    6 CONTINUE                                                              SWQI112
C     ********************************************************************* SWQI113
C                                                                           SWQI114
C     WRITE INPUT PARAMETERS                                                SWQI115
C                                                                           SWQI116
C     ********************************************************************* SWQI117
      WRITE(6,33)KL,INVAL(KL)                                               SWQI118
   33 FORMAT(//,5X,'*** CURVE NO. ',I2,' ***',//,5X,                        SWQI119
     1'NO.  OF TIME INTERVALS FOR THIS SET= ',I3,//,5X,'FROM',10X,'TO')     SWQI120
      WRITE(6,24) ((IBEGIN(J,K),K=1,3),(IEND(J,K),K=1,3),J=1,LAST)          SWQI121
   24 FORMAT(2(5X,I2,'/',I2,'/',I2))                                        SWQI122
      READ(25,25)IDATE,IOPTN,STAT,ISEQ,XXVAL,WQI,TOP                        SWQI123
   25 FORMAT(I6,I2,4A4,I3,2F12.4,12A4)                                      SWQI124
C     ********************************************************************* SWQI125
C                                                                           SWQI126
C     SAVE FIRST STATION NUMBER -- NEEDED FOR PLOT CONTROL                  SWQI127
C                                                                           SWQI128
C     ********************************************************************* SWQI129
      IS1=ISEQ                                                              SWQI130
      GO TO 1                                                               SWQI131
C     ********************************************************************* SWQI132
C                                                                           SWQI133
C     READ STATION RECORD ... IF LAST RECORD GO TO PLOT ROUTINE             SWQI134
C                                                                           SWQI135
C     ********************************************************************* SWQI136
   18 READ(25,25,END=30)IDATE,IOPTN,STAT,ISEQ,XXVAL,WQI,TOP                 SWQI137
    1 IF(ISEQ.EQ.IOLD.OR.KL.GT.1)GO TO 19                                   SWQI138
C     ********************************************************************* SWQI139
C                                                                           SWQI140
C     SAVE STATION DESCRIPTION TO LABEL THE X-AXIS                          SWQI141
C                                                                           SWQI142
C     ********************************************************************* SWQI143
      DO 29  J=1,12                                                         SWQI144
      SNAMES(ISEQ,J)=TOP(J)                                                 SWQI145
   29 CONTINUE                                                              SWQI146
C     ********************************************************************* SWQI147
C                                                                           SWQI148
C     COUNT NUMBER OF STATIONS READ ... FOR TEST VS. NO. OF MILE PTS. RE    SWQI149
C                                                                           SWQI150
C     ********************************************************************* SWQI151
      ICNT=ICNT+1                                                           SWQI152
      IOLD=ISEQ                                                             SWQI153
   19 DO 10 .J=1,LAST                                                       SWQI154
C     ********************************************************************* SWQI155
C                                                                           SWQI156
C     SET BEGINNING DAY TO 1 ...  LAST DAY TO 31 IF BLANK                   SWQI157
C                                                                           SWQI158
C     ********************************************************************* SWQI159
      IF(IBEGIN(J,2).LE.0)IBEGIN(J,2)=1                                     SWQI160
      IF(IEND(J,2).LE.0)IEND(J,2)=31                                        SWQI161
C     ********************************************************************* SWQI162
C                                                                           SWQI163
C     MERGE BEGINNING AND ENDING DATES TO ONE FIELD  ... ALSO ..            SWQI164
C     CHANGE DATE AS MMDDYY TO YYMMDD ...                                   SWQI165
```

PROGRAM C - SOURCE LISTING

```
C                                                                       SWQI166
C     ***************************************************************** SWQI167
      IBEGIN(J,4)=IBEGIN(J,3)*10000+IBEGIN(J,1)*100+IBEGIN(J,2)         SWQI168
      IEND(J,4)=IEND(J,3)*10000+IEND(J,1)*100+IEND(J,2)                 SWQI169
   10 CONTINUE                                                          SWQI170
C     ***************************************************************** SWQI171
C                                                                       SWQI172
C     SELECT THE DATA TO BE PLOTTED  --- USING THE TIME INTERVALS ...   SWQI173
C                                                                       SWQI174
C     ***************************************************************** SWQI175
      DO 9  J=1,LAST                                                    SWQI176
      IF(IDATE.GE.IBEGIN(J,4).AND.IDATE.LE.IEND(J,4))GO TO 27           SWQI177
    9 CONTINUE                                                          SWQI178
C                                                                       SWQI179
C     NO DATA WITHIN DESIRED TIME PERIODS -- READ NEXT RECORD ...       SWQI180
C                                                                       SWQI181
      GO TO 18                                                          SWQI182
C     ***************************************************************** SWQI183
C     TEST IF PLOT BY MILE PT. OR BY STATION  ...                       SWQI184
C     ***************************************************************** SWQI185
   27 IF(ICNTL.LE.0)GO TO 28                                            SWQI186
      XPOINT(INDEX)=DIST(ISEQ)                                          SWQI187
      YPOINT(INDEX)=WQI                                                 SWQI188
      INDEX=INDEX+1                                                     SWQI189
      GO TO 18                                                          SWQI190
   28 XPOINT(INDEX)=ISEQ                                                SWQI191
      YPOINT(INDEX)=WQI                                                 SWQI192
      INDEX=INDEX+1                                                     SWQI193
      GO TO 18                                                          SWQI194
C     ***************************************************************** SWQI195
C                                                                       SWQI196
C     COMPARE MILE POINTS READ VS STATIONS READ ON FIRST PASS ...       SWQI197
C                                                                       SWQI198
C     ***************************************************************** SWQI199
   30 IF(KL.EQ.1.AND.ICNTL.GT.0.AND.ICNT.NE.IL)WRITE(6,31)IL,ICNT       SWQI200
   31 FORMAT(///,10X,'WARNING ***  ',5X,I3,'  MILE POINTS READ    DO NOT SWQI201
     1 MATCH ',I3,'  STATIONS READ')                                    SWQI202
C     ***************************************************************** SWQI203
C                                                                       SWQI204
C     IF DESIRED .. AVERAGE WQI AT SAME STATION FOR A SMOOTH CURVE ...  SWQI205
C                                                                       SWQI206
C     ***************************************************************** SWQI207
      IF(IAVER.LE.0)GO TO 17                                            SWQI208
      INDEX2=1                                                          SWQI209
      IHI=INDEX-1                                                       SWQI210
      XPOINT(INDEX)=-358.                                               SWQI211
      SUM=0.0                                                           SWQI212
      INUM=0                                                            SWQI213
      DO 12 J=1,IHI                                                     SWQI214
   13 SUM = SUM + YPOINT(J)                                             SWQI215
      INUM=INUM + 1                                                     SWQI216
      IF(XPOINT(J+1).EQ.XPOINT(J)) GO TO 12                             SWQI217
C     ***************************************************************** SWQI218
C                                                                       SWQI219
```

PROGRAM C - SOURCE LISTING

```
C     NEW STATION  ... AVERAGE VALUES FOR PREVIOUS STAT....                    SWQI220
C                                                                              SWQI221
C     ************************************************************************ SWQI222
      YAVER(INDEX2)=SUM/FLOAT(INUM)                                            SWQI223
      XAVER(INDEX2)=XPOINT(J)                                                  SWQI224
      INDEX2=INDEX2+1                                                          SWQI225
      SUM=0.0                                                                  SWQI226
      INUM=0                                                                   SWQI227
   12 CONTINUE                                                                 SWQI228
C     ************************************************************************ SWQI229
C                                                                              SWQI230
C     *** COMMANDS BELOW USE THE INTEGRATED PLOTTING PACKAGE ***               SWQI231
C                                                                              SWQI232
C     ************************************************************************ SWQI233
C                                                                              SWQI234
C     TEST IF NO. OF DATA POINTS MEET THE MINIMUM REQUIRED NUMBER              SWQI235
C                                                                              SWQI236
   17 IF(INDEX-1.GE.MINPTS)GO TO 7                                             SWQI237
      WRITE(6,34)INDEX,MINVAL,KL                                               SWQI238
   34 FORMAT(///,5X,'** NOTE **',5X,I3,' DATA POINTS DO NOT MEET THE',         SWQI239
     1' MINIMUM ',I3,' POINTS -- PLOTTING OF CURVE',I3,' WILL BE BYPASSE       SWQI240
     2D')                                                                      SWQI241
      GO TO 92                                                                 SWQI242
C     ************************************************************************ SWQI243
C                                                                              SWQI244
C     INITIAL SET-UP IS DONE DURING FIRST CURVE PROCESSING                     SWQI245
C                                                                              SWQI246
C     ************************************************************************ SWQI247
    7 IF(KL.GT.1)GO TO 45                                                      SWQI248
C                                                                              SWQI249
C     SET FRAME FOR 36 INCH PLOTTER ...                                        SWQI250
C                                                                              SWQI251
      CALL CMLBF('PLEASE RUN ON 1136 PLOTTER')                                 SWQI252
C                                                                              SWQI253
C     SET INITIAL VALUES ON SPECIFICATIONS ARRAY                               SWQI254
C                                                                              SWQI255
      CALL SSPECS(PLDATA)                                                      SWQI256
C                                                                              SWQI257
C     RESET SIZE OF AXES (INCHES)                                              SWQI258
C                                                                              SWQI259
      XSCALE=10.0                                                              SWQI260
      YSCALE=5.0                                                               SWQI261
      PLDATA(7)=XSCALE                                                         SWQI262
      PLDATA(8)=YSCALE                                                         SWQI263
C                                                                              SWQI264
C     MOVE X-AXIS 5.5 INCHES AWAY FROM ORIGIN                                  SWQI265
C                                                                              SWQI266
      PLDATA(2)=5.5                                                            SWQI267
      IF(ICNT.LT.ISEQ)ICNT=ISEQ                                                SWQI268
C     ************************************************************************ SWQI269
C                                                                              SWQI270
C     SET RANGE OF VALUES ON X-AXIS ** FOR MILE POINTS OR STATION NOS.         SWQI271
C                                                                              SWQI272
C     ************************************************************************ SWQI273
```

PROGRAM C - SOURCE LISTING

```
      IF(ICNTL.GT.0)GO TO 35                                              SWQI274
      PLDATA(3)=IS1+ICNT-1                                                SWQI275
      PLDATA(4)=IS1                                                       SWQI276
      PLDATA(9)=ICNT-1                                                    SWQI277
C                                                                         SWQI278
C     ANNOTATIONS WILL HAVE NO DECIMALS                                   SWQI279
C                                                                         SWQI280
      PLDATA(28)=0.0                                                      SWQI281
      GO TO 36                                                            SWQI282
C     ********************************************************************SWQI283
C                                                                         SWQI284
C     CHOOSE SCALE NUMBERS FOR MILE POINTS ...                            SWQI285
C                                                                         SWQI286
C     ********************************************************************SWQI287
   35 GIVEN(1)=DIST(IL)                                                   SWQI288
      GIVEN(2)=DIST(1)                                                    SWQI289
      GIVEN(3)=IL - 1                                                     SWQI290
      CALL FABLIX(GIVEN,PLDATA)                                           SWQI291
C                                                                         SWQI292
C     ALLOW ONE DECIMAL IN MILE POINTS                                    SWQI293
C                                                                         SWQI294
      PLDATA(28)=1.0                                                      SWQI295
C     ********************************************************************SWQI296
C                                                                         SWQI297
C     SET RANGE OF VALUES ON Y-AXIS                                       SWQI298
C                                                                         SWQI299
C     ********************************************************************SWQI300
   36 PLDATA(5)=100.                                                      SWQI301
      PLDATA(6)=0.0                                                       SWQI302
C     CHANGE DEFAULT VALUE OF DIVISIONS FOR Y-AXIS                        SWQI304
C                                                                         SWQI307
C     DRAW ANNOTATION NUMBERS AT THE BOTTOM SCALE MARKS                   SWQI308
C                                                                         SWQI309
      CALL NODLIB(PLDATA)                                                 SWQI310
C                                                                         SWQI311
C     DRAW ANNOTATION NUMBER AT THE LEFT SCALE MARKS                      SWQI312
C                                                                         SWQI313
      CALL NODLIL(PLDATA)                                                 SWQI314
C     ********************************************************************SWQI315
C                                                                         SWQI316
C     DRAW  X-Y AXES - WITH TWICE AS MANY TICKS AS  ANNOTATIONS IN Y-AXI  SWQI317
C                                                                         SWQI318
C     ********************************************************************SWQI319
      PLDATA(10)=PLDATA(10)*2.0                                           SWQI320
      CALL AXLILI(PLDATA)                                                 SWQI321
C                                                                         SWQI322
CC    CLEAR ZONES VARIABLES --  SINCE UPDATED BY ABOVE SUBROUTINE         SWQI323
C                                                                         SWQI324
      CALL ZZONES(PLDATA)                                                 SWQI325
C     ********************************************************************SWQI326
C                                                                         SWQI327
C     WRITE LEGEND IDENTIFICATION ...                                     SWQI328
C                                                                         SWQI329
C     ********************************************************************SWQI330
```

PROGRAM C - SOURCE LISTING

```
      PLDATA(22)=5.0                                                    SWQI331
      PLDATA(23)=12.0                                                   SWQI332
      CALL GTITLE('/*** LEGEND ***/',PLDATA)                            SWQI333
C                                                                       SWQI334
C     SET PLOTTING SYMBOL DESIRED                                       SWQI335
C                                                                       SWQI336
   45 PLDATA(16)=SYMBOL(KL)                                             SWQI337
      IF(IAVER.GT.0)GO TO 14                                            SWQI338
C                                                                       SWQI339
C     ENTER NUMBER OF DATA POINTS TO PLOT                               SWQI340
C                                                                       SWQI341
      PLDATA(13)=INDEX-1                                                SWQI342
C     PLOT SYMBOL AT DATA POINT LOCATIONS                               SWQI343
      CALL PSLILI(XPOINT,YPOINT,PLDATA)                                 SWQI344
C     ****************************************************************  SWQI345
C                                                                       SWQI346
C     NOW CONNECT DATA POINTS WITH PARABOLAS TO FIT THE DATA ...        SWQI347
C                                                                       SWQI348
C     ****************************************************************  SWQI349
      CALL PFLILI(XPOINT,YPOINT,BUFX,BUFY,PLDATA)                       SWQI350
      GO TO 15                                                          SWQI351
C                                                                       SWQI352
C     ENTER NUMBER OF DATA POINTS TO PLOT                               SWQI353
C                                                                       SWQI354
   14 PLDATA(13)=INDEX2-1                                               SWQI355
C                                                                       SWQI356
C     PLOT SYMBOL AT DATA POINT LOCATIONS                               SWQI357
C                                                                       SWQI358
      CALL PSLILI(XAVER,YAVER,PLDATA)                                   SWQI359
C     ****************************************************************  SWQI360
C                                                                       SWQI361
C     NOW CONNECT DATA POINTS WITH PARABOLAS TO FIT THE DATA ...        SWQI362
C                                                                       SWQI363
C     ****************************************************************  SWQI364
      CALL PFLILI(XAVER,YAVER,BUFX,BUFY,PLDATA)                         SWQI365
C     ****************************************************************  SWQI366
C                                                                       SWQI367
C     WRITE TEXT IN GRAPH LEGEND FOR THIS CURVE ...                     SWQI368
C                                                                       SWQI369
C     ****************************************************************  SWQI370
   15 DO 48  J=1,12                                                     SWQI371
      TOP(J)=LEGEND(KL,J)                                               SWQI372
   48 CONTINUE                                                          SWQI373
C                                                                       SWQI374
C     REDUCE SIZE OF TEXT BY HALF ...                                   SWQI375
C                                                                       SWQI376
      PLDATA(17)=PLDATA(17)/2.0                                         SWQI377
      PLDATA(18)=PLDATA(18)/2.0                                         SWQI378
C                                                                       SWQI379
C     SET INITIAL POSITION OF LEGEND TEXT                               SWQI380
C                                                                       SWQI381
      PLDATA(22)=5.0                                                    SWQI382
      PLDATA(23)=11.8 - (.2*(KL-1))                                     SWQI383
C                                                                       SWQI384
```

PROGRAM C - SOURCE LISTING

```
C     WRITE LEGEND TWICE SO ITS LEGIBLE ...                                  SWQI385
C                                                                            SWQI386
      DO 47  LL=1,2                                                          SWQI387
      CALL SYMKEY(TOP,PLDATA)                                                SWQI388
   47 CONTINUE                                                               SWQI389
C                                                                            SWQI390
C     RESTORE SIZE OF TEXT ...                                               SWQI391
C                                                                            SWQI392
      PLDATA(17)=PLDATA(17)*2.0                                              SWQI393
      PLDATA(18)=PLDATA(18)*2.0                                              SWQI394
C     ************************************************************************SWQI395
C                                                                            SWQI396
C     LABELLING OF GRAPH -- ONLY ON PROCESSING OF FIRST CURVE ...            SWQI397
C                                                                            SWQI398
C     ************************************************************************SWQI399
      IF(KL.GT.1)GO TO 91                                                    SWQI400
C                                                                            SWQI401
C     CHANGE DEFAULT SPACING OF TITLES TO THE AXES                           SWQI402
C                                                                            SWQI403
      PLDATA(24)=.20                                                         SWQI404
      PLDATA(26)=.60                                                         SWQI405
      IF(ICNTL.GT.0)GO TO 37                                                 SWQI406
      CALL TITLEB('+  STATION NUMBER+',PLDATA)                               SWQI407
      GO TO 38                                                               SWQI408
   37 CALL TITLEB('+  STATION MILE POINT+',PLDATA)                           SWQI409
   38 IF(IOPTN.EQ.0)CALL TITLEL('+CUMM NSF WATER QUALITY INDEX+',PLDATA)     SWQI410
      IF(IOPTN.NE.0)CALL TITLEL('+MULT NSF WATER QUALITY INDEX+',PLDATA)     SWQI411
C                                                                            SWQI412
C     PRINT GRAPH DESCRIPTION AT X-AXIS ROTATING TEXT 270 DEGREES            SWQI413
C                                                                            SWQI414
      PLDATA(20)=-90.0                                                       SWQI415
C                                                                            SWQI416
C     REDUCE SIZE OF LETTERS BY HALF ...                                     SWQI417
C                                                                            SWQI418
      PLDATA(17)=PLDATA(17)/2.                                               SWQI419
      PLDATA(18)=PLDATA(18)/2.                                               SWQI420
C                                                                            SWQI421
C     SET DISTANCE FROM FRAME ORIGIN FOR STAT. DESCRIPTION                   SWQI422
C                                                                            SWQI423
      PLDATA(23)=4.8                                                         SWQI424
C     ************************************************************************SWQI425
C                                                                            SWQI426
C     COMPUTE INCREMENT BETWEEN STATIONS IN X-AXIS ... THEN USE THIS         SWQI427
C     INCREMENT TO PLOT STATION NAME AT MILE PT. OR STATION NO. ...          SWQI428
C                                                                            SWQI429
C     ************************************************************************SWQI430
      IF(ICNTL.LE.0)FACTOR=XSCALE/(ICNT- 1)                                  SWQI431
      IF(ICNTL.GT.0)FACTOR=XSCALE/(PLDATA(3)-PLDATA(4))                      SWQI432
      DO 40 J=1,ICNT                                                         SWQI433
      IF(ICNTL.LE.0) GO TO 41                                                SWQI434
      PLDATA(22)=FACTOR*DIST(J)+PLDATA(1)-FACTOR*PLDATA(4)                   SWQI435
      GO TO 42                                                               SWQI436
   41 PLDATA(22)=FACTOR*(IS1+(J-2) ) + PLDATA(1)                             SWQI437
   42 DO 44  JJ=1,12                                                         SWQI438
```

PROGRAM C - SOURCE LISTING

```
      TOP(JJ)=SNAMES(J,JJ)                                                  SWQI439
   44 CONTINUE                                                              SWQI440
      CALL GTITLE(TOP,PLDATA)                                               SWQI441
   40 CONTINUE                                                              SWQI442
C                                                                           SWQI443
C     RESTORE SIZE OF TEXT ...                                              SWQI444
C                                                                           SWQI445
      PLDATA(17)=PLDATA(17)*2.                                              SWQI446
      PLDATA(18)=PLDATA(18)*2.                                              SWQI447
C                                                                           SWQI448
C     RESTORE ANGLE OF TEXT TO HORIZONTAL POSITION ...                      SWQI449
C                                                                           SWQI450
      PLDATA(20)=0.0                                                        SWQI451
C     ********************************************************************* SWQI452
C                                                                           SWQI453
C     RE-INITIALIZE STATION FILE, CLEAR DATA ARRAYS ...                     SWQI454
C                                                                           SWQI455
C     ********************************************************************* SWQI456
   91 INDEX=INDEX-1                                                         SWQI457
      WRITE(6,46)KL,INDEX                                                   SWQI458
   46 FORMAT(/,9X,'PLOTTING FOR CURVE NO.',I3,' -- PROCESSED SUCCESSFULL    SWQI459
     1Y WITH',I4,' POINTS')                                                 SWQI460
   92 REWIND 25                                                             SWQI461
      DO 39 J=1,INDEX                                                       SWQI462
      XPOINT(J)=0.0                                                         SWQI463
      YPOINT(J)=0.0                                                         SWQI464
   39 CONTINUE                                                              SWQI465
   99 CONTINUE                                                              SWQI466
C     ********************************************************************* SWQI467
C                                                                           SWQI468
C     CLOSE NEUTRAL TEXT ...                                                SWQI469
C                                                                           SWQI470
C     ********************************************************************* SWQI471
      CALL PPPEND(PLDATA)                                                   SWQI472
      STOP                                                                  SWQI473
      END                                                                   SWQI474
/*                                                                          SWQI475
```

SOURCE DECKS AT OSI

For the convenience of potential users, the source language statements for these three programs have been stored in an "on-line" disk pack at the OSI computer facility as Wylbur data sets:

DATASET NAME	DESCRIPTION	VOLUME
CNR2TW.GAN.WQI.TIME.SOURCE	PROGRAM A	TSOØØ1
CNR2TW.GAN.FIVE.PARAM.SOURCE	PROGRAM B	TSOØØ1
CNR2TW.GAN.WQI.SEASONAL.SOURCE	PROGRAM C	TSOØØ1

Source decks may also be obtained from the EPA Region II Data Systems Branch office.

PROGRAM EXECUTION FROM LOAD MODULES

To save expenses in compilation and link-editing, these programs also exist as core-image modules on a partitioned data set at OSI as follows:

DATASET NAME	MEMBER NAME	DESCRIPTION	VOLUME
CNR2TW.GAN.WQI.LOADLIB	(TIMEWQI)	PROGRAM A	TSOØØ1
CNR2TW.GAN.WQI.LOADLIB	(FIVEPARM)	PROGRAM B	TSOØØ1
CNR2TW.GAN.WQI.LOADLIB	(SEASONAL)	PROGRAM C	TSOØØ1

The JCL procedure for the execution of these data sets with the proper plot post-processor is shown in the sample input sections.

INTERACTIVE PROCESSING WITH TEKTRONICS TERMINAL

These programs presently have limited interactive application under the Time Sharing Option at the OSI facility. The programs execute successfully, but because the plotting text is hardware generated by the Tektronics terminal and not drawn by the software, the resulting plots are unsatisfactory. These problems will hopefully be resolved once Calcomp preview procedures for the Tektronics terminal are implemented at the OSI facility.

Application to the Raritan River Basin

The Raritan River Basin is the largest intra-state surface watershed in New Jersey. The mainstream section which is approximately 30 miles long extends from the River's mouth at Raritan Bay to the confluence of the north and south branches. Figure 2 is a map of the area showing the Raritan River Basin and its major tributaries. The six digit numbers in this figure are the STORET primary station numbers.

As a test application, the water quality parameters required were retrieved from the STORET system for these stations in the Raritan River South Branch and the mainstream. Programs A and C were processed using this data.

The water quality index profiles for winter and summer conditions for three separate time intervals:

1) 1968 - 1969
2) 1970 - 1972
3) 1973 - Present

are shown in the next four pages. The graphs by station number begin at the origin of the South Branch (the downstream end of Budd Lake) and ends at the Raritan Bay. The graphs by station mile point are in reverse order, they start at the mouth of the Raritan River and travel upstream to the origin of the South Branch. As expected, the index is overall higher during the winter season. Trends of the index as one goes up or down the Raritan Basin, as well as any changes during the defined time intervals can be easily assessed from these pages.

STATE OF NEW JERSEY

INPUT CONTROL PARAMETERS

TOTAL NO. OF INTERVAL SETS = 3

*** CURVE NO. 1 ***

NO. OF TIME INTERVALS FOR THIS SET= 2

FROM	TO
6/ 1/68	9/30/68
6/ 1/69	9/30/69

PLOTTING FOR CURVE NO. 1 -- PROCESSED SUCCESSFULLY WITH 19 POINTS

*** CURVE NO. 2 ***

NO. OF TIME INTERVALS FOR THIS SET= 3

FROM	TO
6/ 1/70	9/31/70
6/ 1/71	9/31/71
6/ 1/72	9/31/72

PLOTTING FOR CURVE NO. 2 -- PROCESSED SUCCESSFULLY WITH 45 POINTS

*** CURVE NO. 3 ***

NO. OF TIME INTERVALS FOR THIS SET= 3

FROM	TO
6/ 1/73	9/31/73
6/ 1/74	9/31/74
6/ 1/75	9/31/75

PLOTTING FOR CURVE NO. 3 -- PROCESSED SUCCESSFULLY WITH 15 POINTS

INPUT CONTROL PARAMETERS

TOTAL NO. OF INTERVAL SETS = 3

*** CURVE NO. 1 ***

NO. OF TIME INTERVALS FOR THIS SET= 8

FROM	TO
11/ 1/65	12/31/65
1/ 1/67	2/30/67
11/ 1/67	12/31/67
1/ 1/68	2/30/68
11/ 1/68	12/31/68
1/ 1/69	2/30/69
11/ 1/69	12/31/69
1/ 1/70	2/30/70

PLOTTING FOR CURVE NO. 1 -- PROCESSED SUCCESSFULLY WITH 58 POINTS

*** CURVE NO. 2 ***

NO. OF TIME INTERVALS FOR THIS SET= 6

FROM	TO
11/ 1/70	12/31/70
1/ 1/71	2/30/71
11/ 1/71	12/31/71
1/ 1/72	2/30/72
11/ 1/72	12/31/72
1/ 1/73	2/30/73

PLOTTING FOR CURVE NO. 2 -- PROCESSED SUCCESSFULLY WITH 62 POINTS

*** CURVE NO. 3 ***

NO. OF TIME INTERVALS FOR THIS SET= 6

FROM	TO
11/ 1/73	12/31/73
1/ 1/74	2/30/74
11/ 1/74	12/31/74
1/ 1/75	2/30/75
11/ 1/75	12/31/75
1/ 1/76	2/30/76

PLOTTING FOR CURVE NO. 3 -- PROCESSED SUCCESSFULLY WITH 19 POINTS

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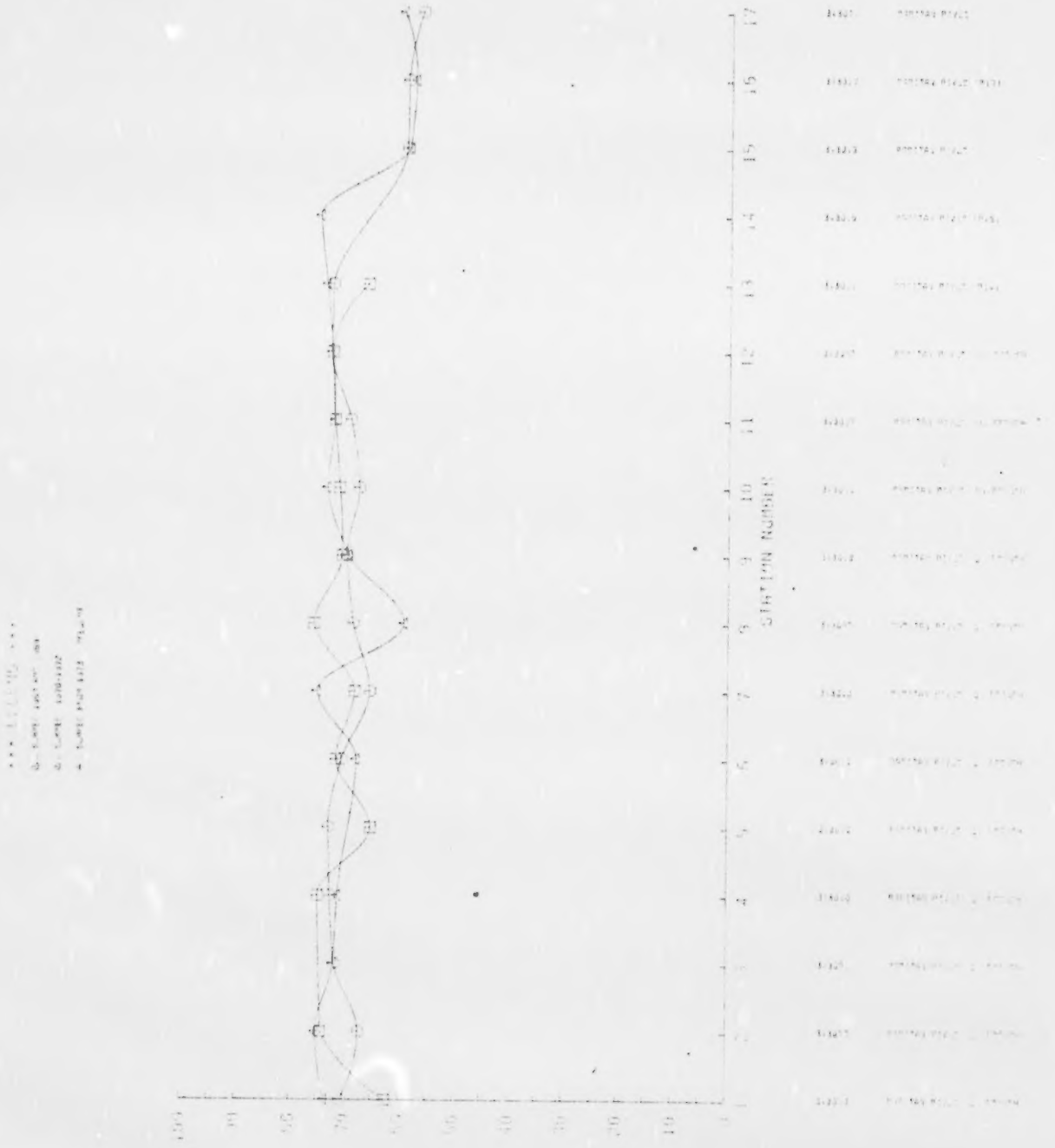
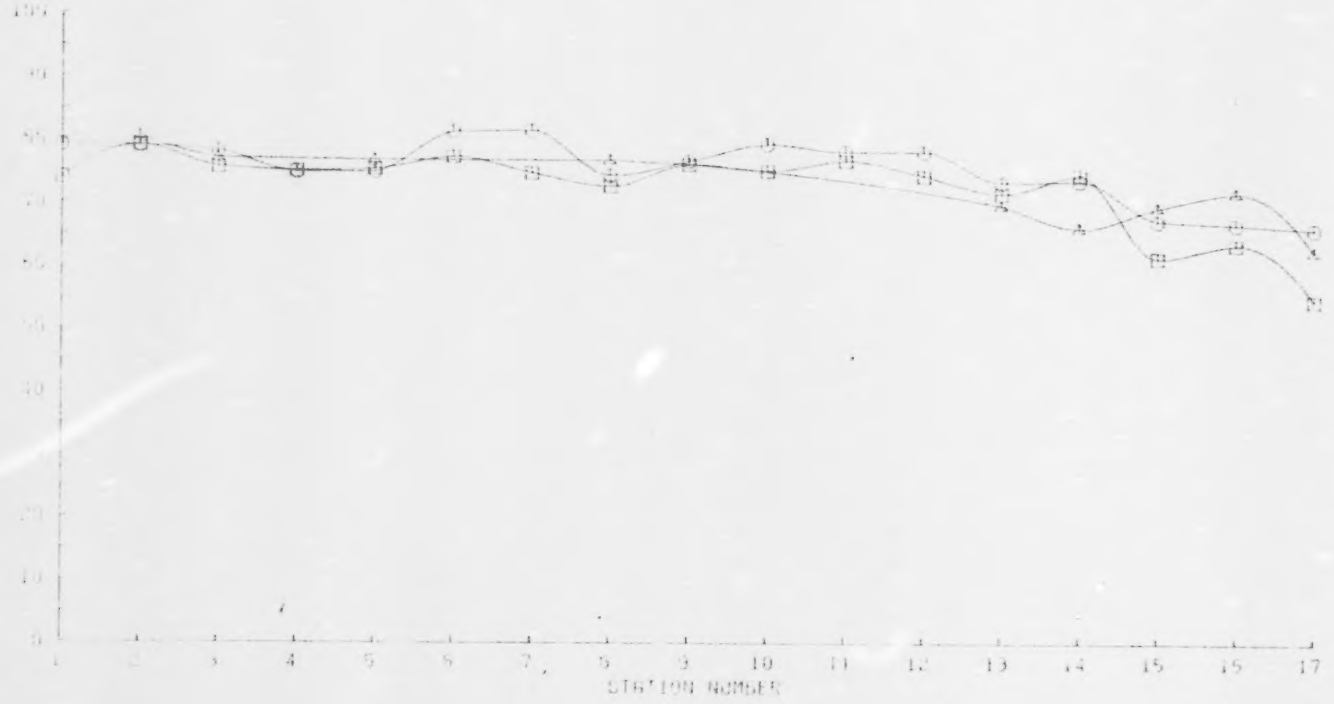
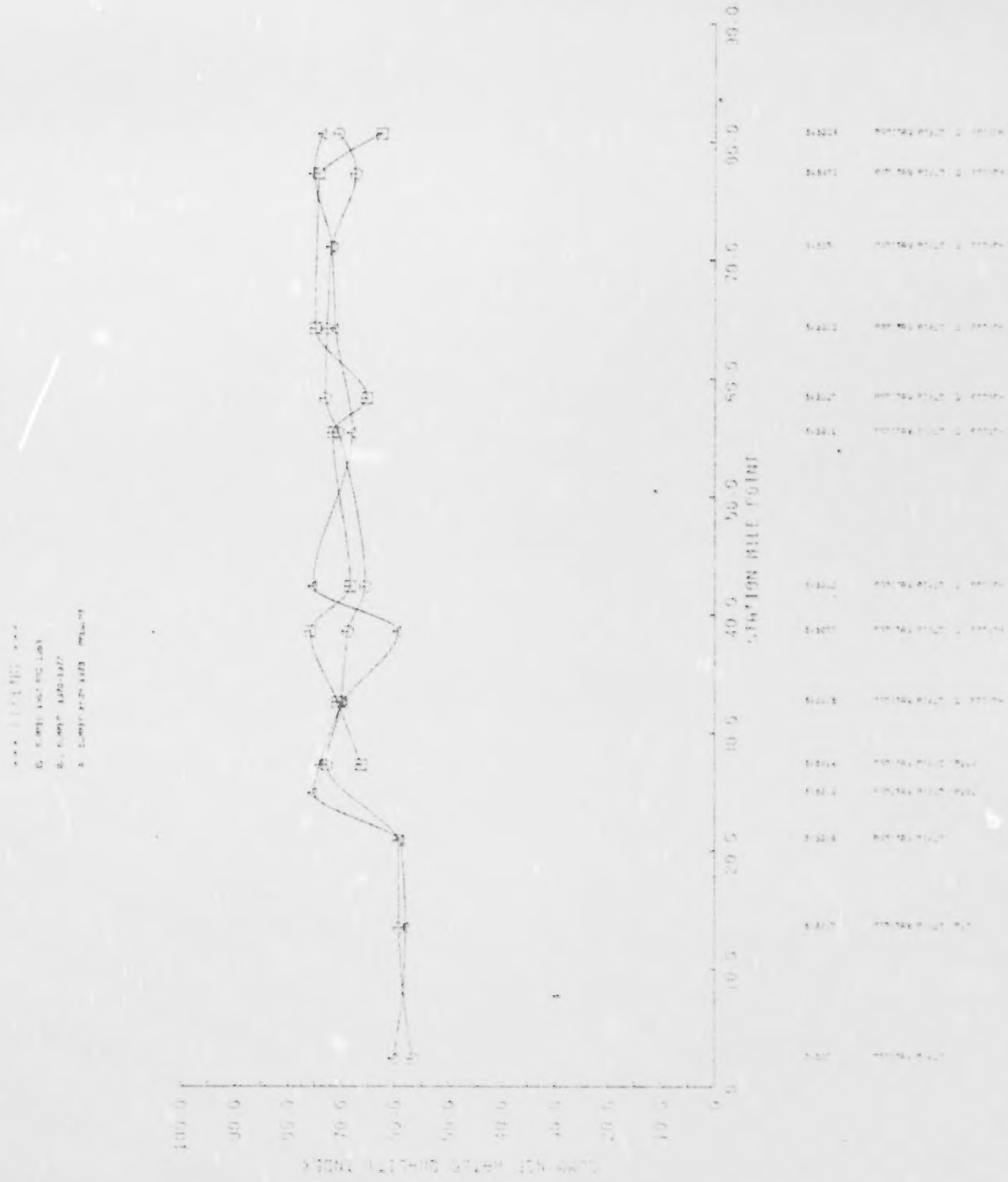
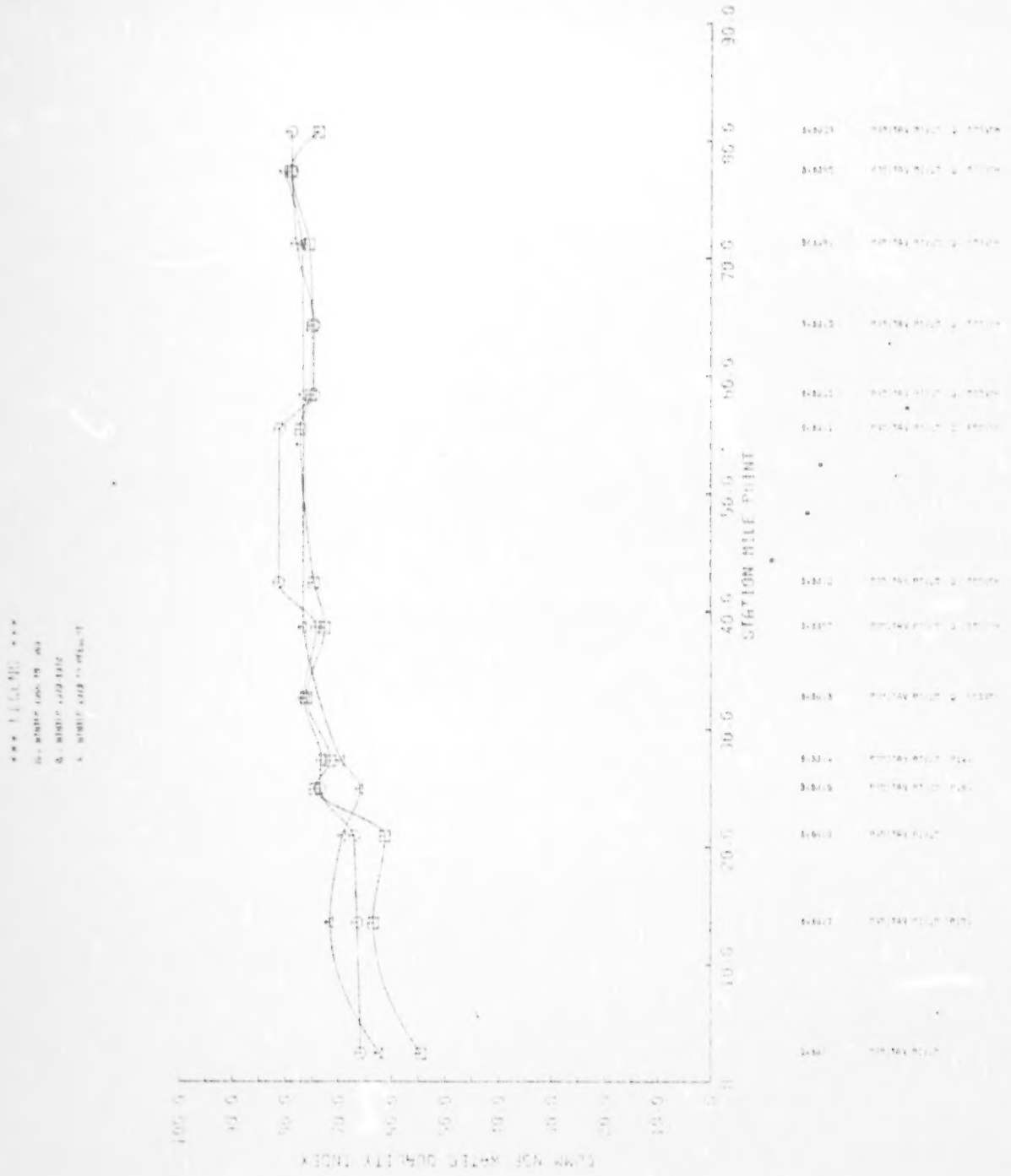



STATION NUMBERS

Reproduced from
best available copy.




STATION MILE POINT
30.0
40.0
50.0
60.0
70.0
80.0

ACKNOWLEDGEMENTS

Thanks must be extended to Robert Hicke of Systems Architects Inc. for his assistance in the implementation of these programs. Thanks also to Barbara Sue Clark and George Lackowitz of EPA for their assistance in verifying results and refining the qualigram data. The typing was very professionally done by Ms. MaryAnn LaBarbera.

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(1) McClelland, N.I., Water Quality Index Application in the Kansas River Basin, USEPA, Region VII, Kansas City, Missouri. Report No. EPA-907/9-74-001 February 1974

(2) Ashbrook, J.D. and Sande, S., A User's Guide to the Integrated Plotting Package, National Institutes of Health, D.H.E.W., Bethesda, Maryland March 1975

(3) User's Manual for EPA Scientific Applications Software, MIDSD, Washington, D.C. July 1975

(4) Greeley, R.S., Johnson, A. et al, Water Quality Indices MITRE Corporation, Washington, D.C. 1972

(5) Effect of Geographical Location on Cooling Pond Requirements and Performance, pp. 146-234, USEPA, Water Quality Office, Washington, D.C. Report No. 16130FDQ03/71, March 1971

Appendix A

DIGITIZED UNIT QUALIGRAMS USED BY COMPUTER PROGRAMS

WATER QUALITY INDEX

DISSOLVED OXYGEN

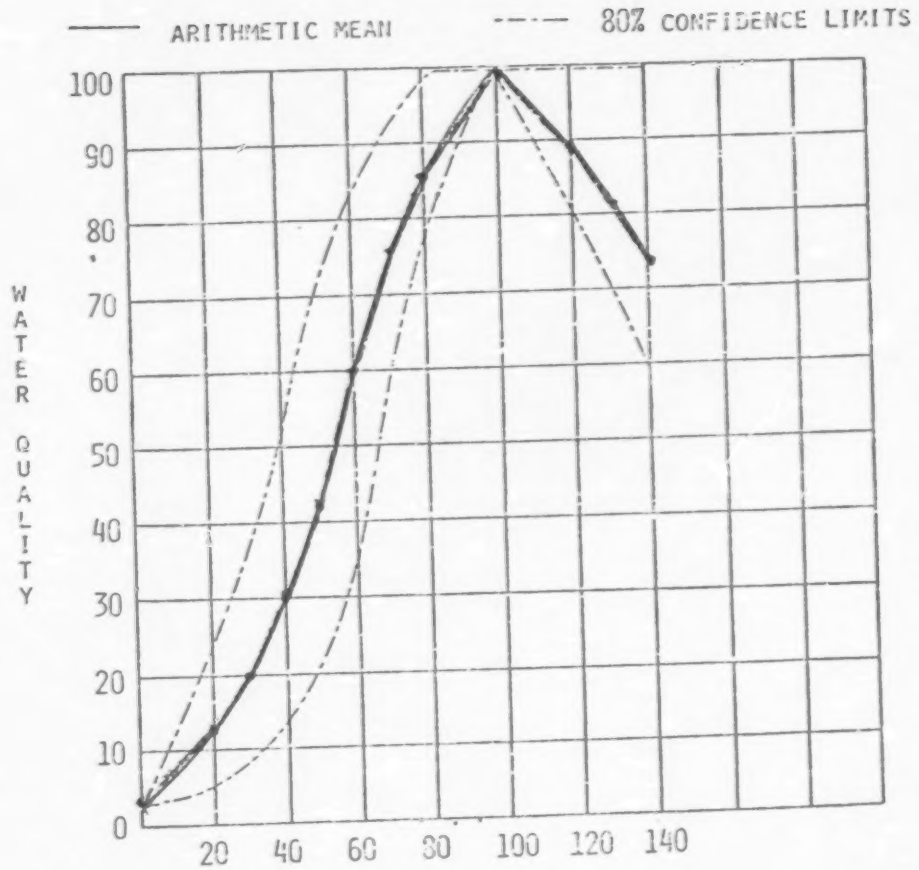


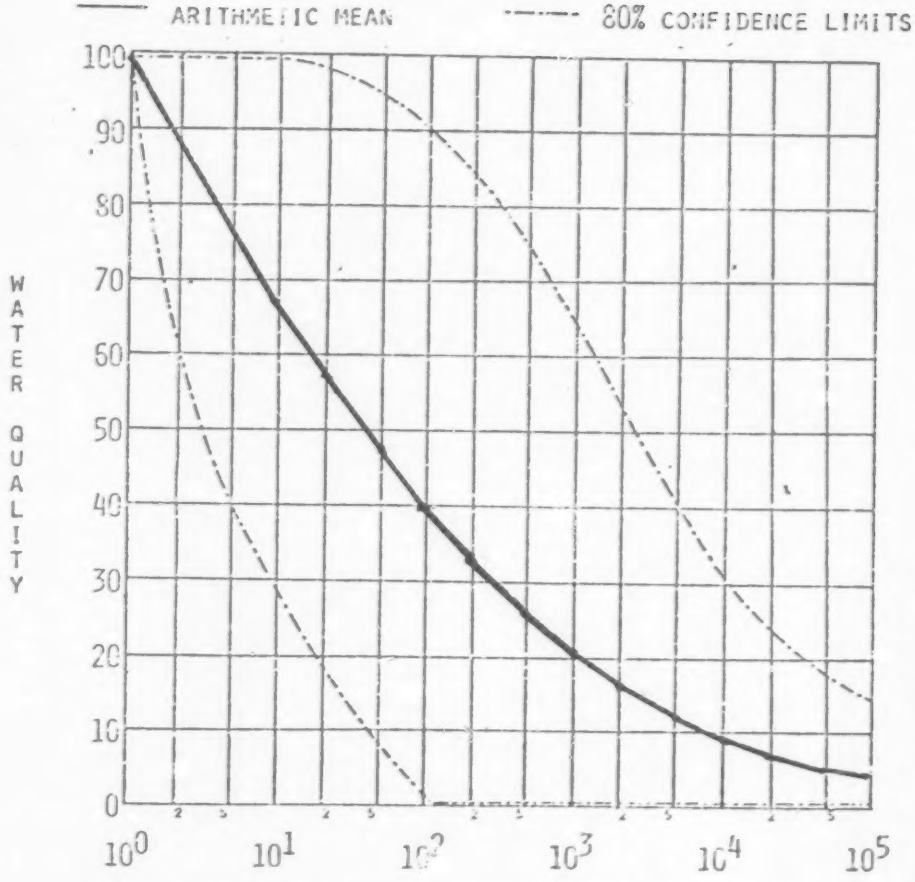
Figure A-1

$W = 0.17$

NOTE:
FOR D.O. >140% SAT,
$q_i = 50.$

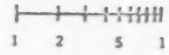
WATER QUALITY INDEX

FECAL COLIFORMS



FECAL COLIFORMS, AVERAGE NUMBER OF ORGANISMS PER 100 ML
Figure A-2

W = 0.15



KEY FOR LOG SCALE INTERPOLATION

NOTE:
FOR F.C. >10(5)/100ML
q_i = 2.

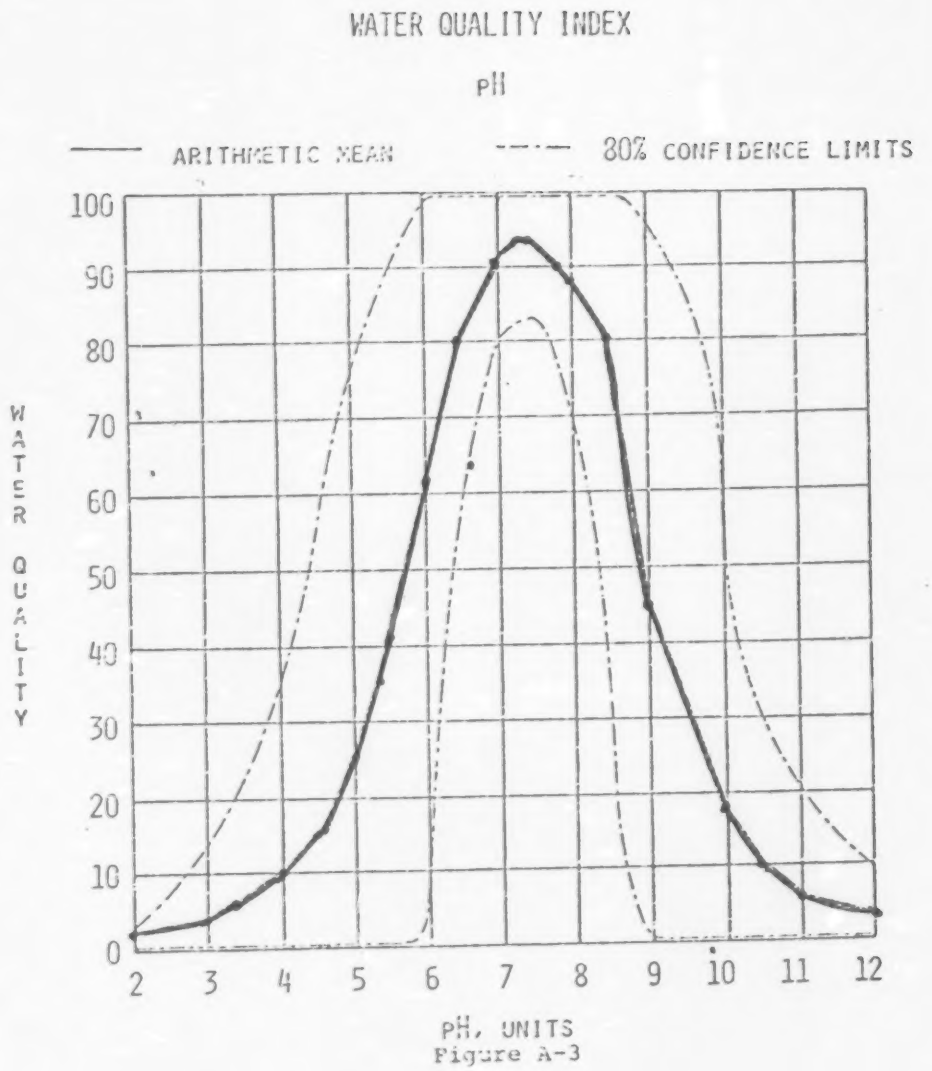


Figure A-3

$w = 0.12$

WATER QUALITY INDEX

BOD5

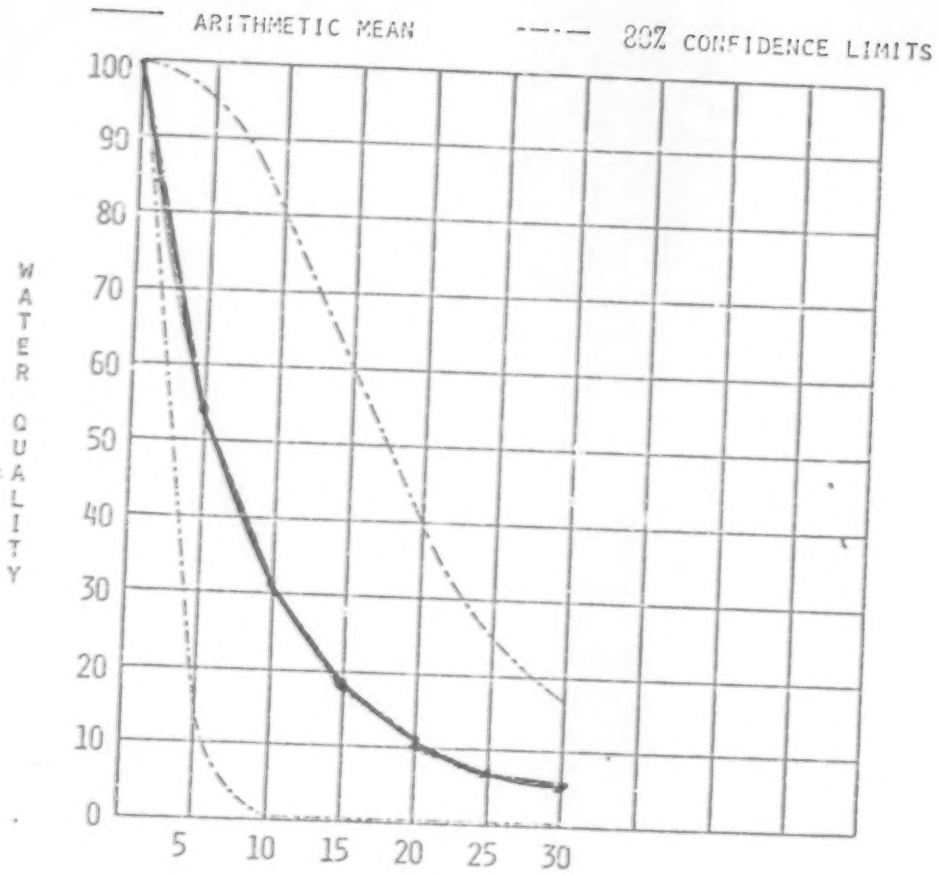


Figure A-4

$w = 0.10$

NOTE:
FOR $BOD_5 > 30$,
$q_i = 2.$

WATER QUALITY INDEX

NITRATES

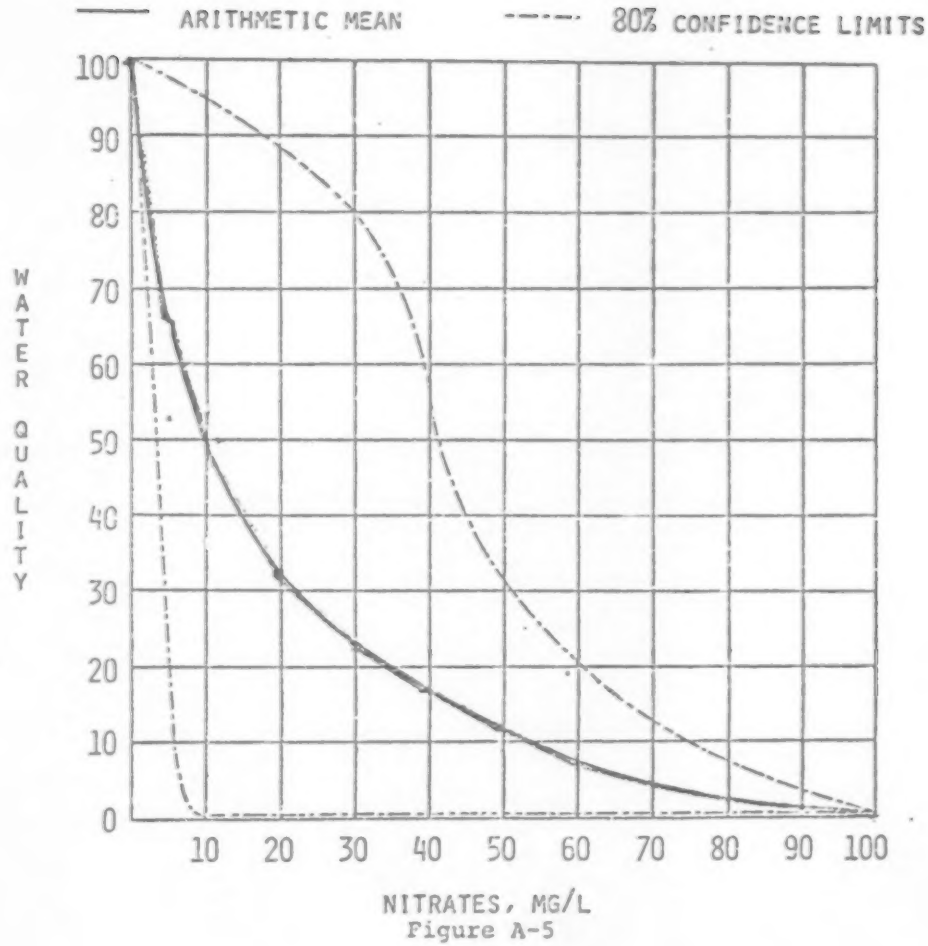


Figure A-5

W = 0.10

NOTE:
FOR NITRATES >100 MG/L
$q_i = 1.$

WATER QUALITY INDEX

TOTAL PHOSPHATES

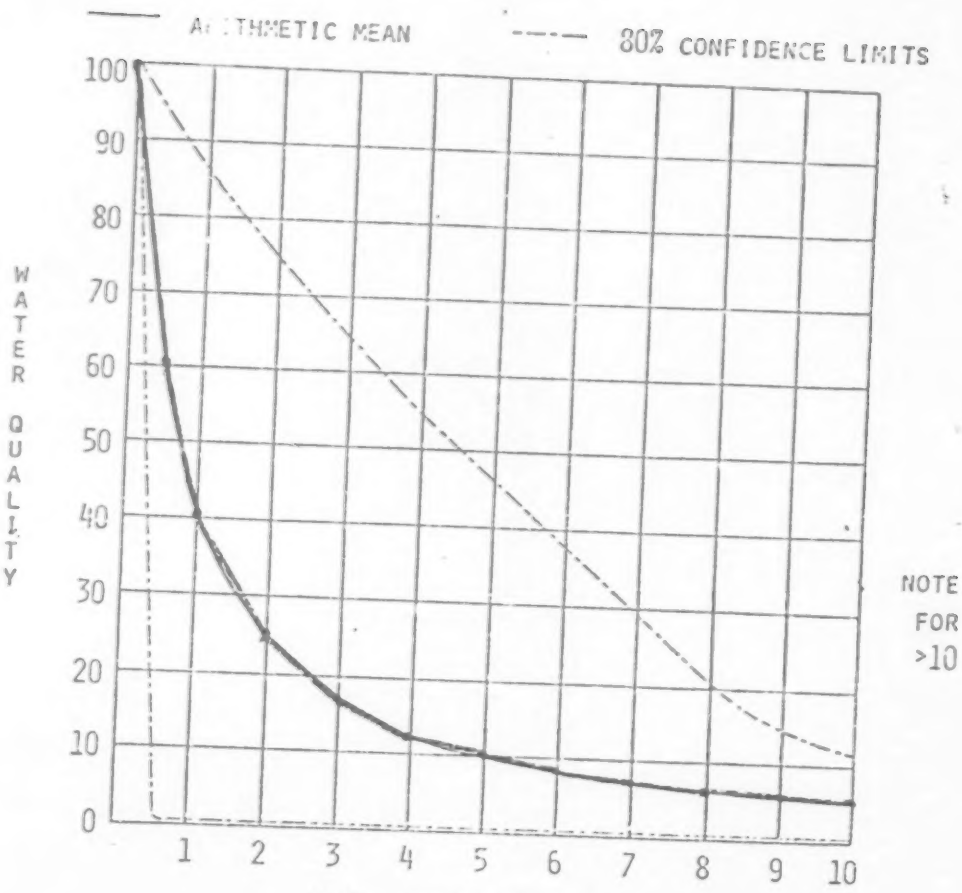


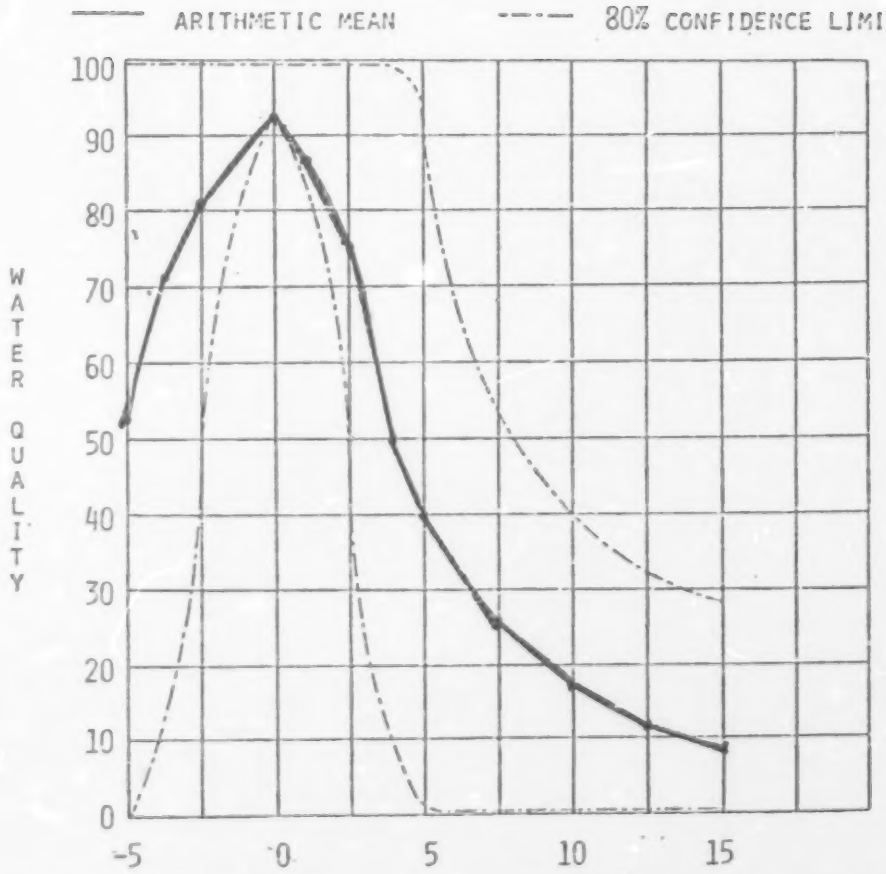
Figure A-6

$W = 0.10$

NOTE:
FOR TOTAL PHOSPHATES >10 MG/L, $q_i = 2$.

WATER QUALITY INDEX

TEMPERATURE



$w = 0.10$

NOTE:
FOR TEMPERATURE DEVIATION
>15°C, $q_i = 5$.

Figure A-7

WATER QUALITY INDEX

TURBIDITY

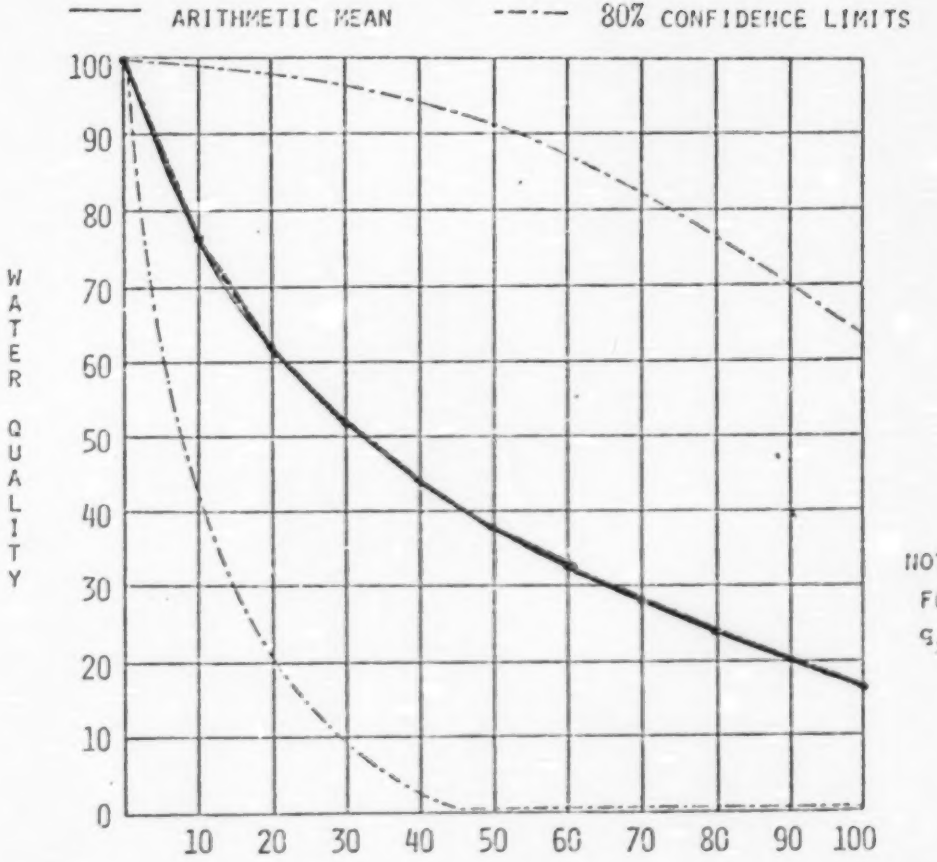


Figure A-8

W = 0.08

NOTE:
FOR TURBIDITY >100 JTU
s_i = 5.

WATER QUALITY INDEX

TOTAL SOLIDS

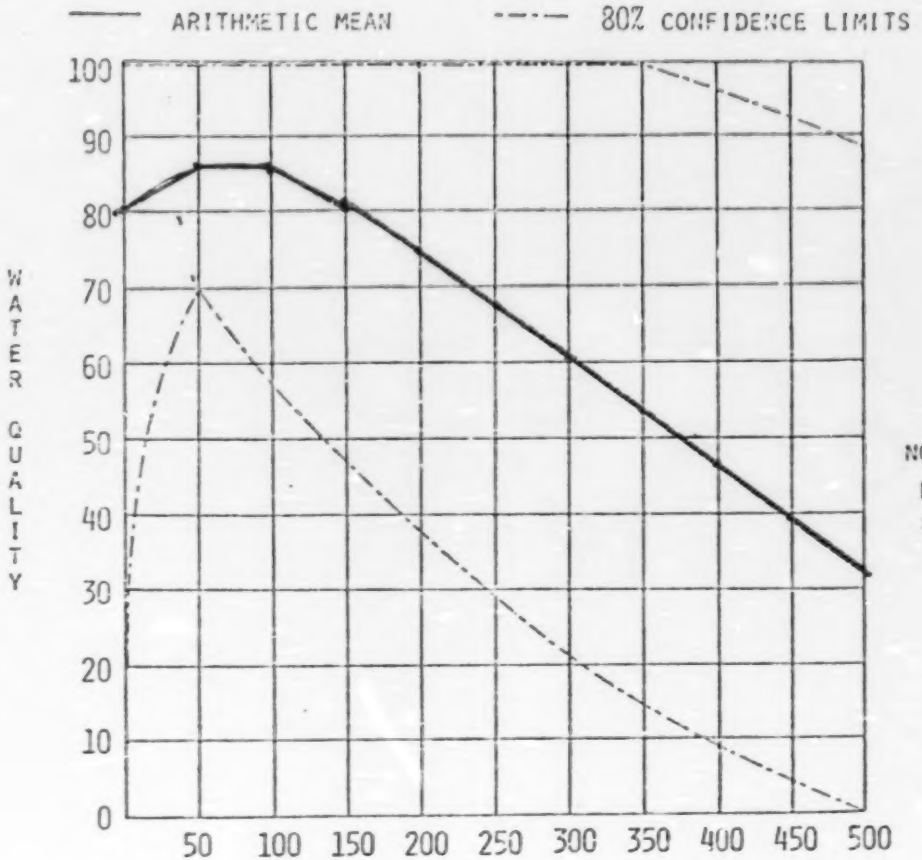


Figure 2-4

w = 0.08

NOTE:
FOR TOTAL SOLIDS >500 MG/L, q_i = 20.